上海市金融保险教育高地建设项目
复旦卓越·21世纪金融学教材新系

国际金融

（双语）

Guoji Jinrong

姚迪克　编著

复旦大学出版社

复旦卓越·21世纪金融学教材新

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本教材编委会精心策划，在总结过去教材建设经验的基础上，结合应用型本科教育的特点，借鉴国内外的经验做法，在金融学专业的课程体系、课程内容、教学方法、教材编写等方面进行进一步探索和创新。

本教材系列具有五个方面的特点。第一，创新性。从培养学生的兴趣入手，以掌握方法论和创造性思维为主线，以知识、概念和理论为基石，进行总体设计，思路新颖，写作体例风格独特。第二，前瞻性。搜集了最新的数据资料和理论研究成果，使教材内容着力体现超前性、前沿性、动态性。第三，实践性。体现了实践型本科教学和金融学的专业特点，以提高学生竞争力、综合素质和社会适应能力为最终目标，适当增加国际先进专业资格认证考试的相关内容，如特许金融分析师、精算师、保险金融行业资格考试、金融风险管理师考试等。第四，系统性。基础知识、学科理论和政策体系融为一体，注重金融理论与金融应用的结合、金融改革与金融发展的结合、宏观金融与微观金融的结合、对内金融与对外开放金融的结合、历史金融与现实金融的结合。第五，可读性。突出"以学生为中心"的思想，强调学以致用，所用语言浅显易懂，并附有一定的案例分析。

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内容提要

本书用简明通俗的英语阐述了《国际金融》课程大致应包括的基本内容：国际金融的产生与发展，国际收支，外汇市场，国际货币体系，汇率，货币衍生品市场，国际金融市场，国际收支调整理论，开放经济体的宏观经济政策等。

本书简明易懂，文字力求浅显、准确。对于理论的介绍除了文字叙述以外，尽量采用一些图表和公式，从而简化了一些比较难以理解的理论问题。本书所收集的资料、数据与理论研究成果都是最新的。

本书适合高校财经专业本科生课堂学习，此书同样适用于具有同等文化程度的自学者。

为配合教学，本书为任课教师提供了教学辅助资料，如教学大纲、PPT讲义，每章后面除了书上的概念题之外，另外还有一整套作业题以及答案（联系方式见前言中的信息）。

总　　序

在经济全球化和区域一体化的背景下，金融创新日新月异，国际金融运行的风险也随之增加，保证金融安全、高效、稳定运行成为各国特别是发展中国家面临的重要而急迫的任务。改革开放以来，我国逐步建立了系统、完整的大金融组织体系，金融已渗透到社会经济生活的各个层面，成为现代经济的核心。入世后，实行了金融开放政策，加快了融入国际金融的步伐，金融国际化、经济金融化和金融市场化的态势日趋明显。外资银行的不断进入，引发了深层次的金融变革，国内金融服务业也呈现出多样化和专业化发展的态势。随着金融业务的快速发展和金融产品的延伸，金融人才的需求持续增加。金融在经济发展中作用的发挥也越来越依赖于高层次金融人才的培养。

为了将上海高校的一批重要专业建设成为上海乃至全国的人才培养基地和高等院校教学研究与师资培训中心，成为在国内外有一定知名度和影响力的本科教育高地，为上海城市发展和经济建设提供人力资源保障，合理规划高等教育学科布局，提升高等院校本科教育整体水平，围绕"科教兴市"的主战略，在高等院校原有优势学科发展的基础上，上海市每年投入专项资金重点建设金融保险、海关物流、外贸经济、艺术音乐、旅游会展、语言文学、政治法律、教师教育、卫生体育和影视传播等十大本科教育高地。教育高地坚持改革创新、科学发展、质量第一和开放合作原则，在师资队伍、专业建设、教学条件、教学管理、教学效果与人才培养质量五个方面进行重点建设。

因此，为了适应国际经济理论的不断创新与拓展以及金融业务发展的需要，加快培养出更多掌握经济学理论知识、具有国际视野、了解国际惯例、懂得全球一致的业务规范、熟悉取向统一的管理法规、掌握金融业务操作能力的金融学专业的应用型国际化人才，必须从金融学专业的课程体系、课程内容、教学方法、教材编写等方面进行进一步探索和创新。

"复旦卓越·21世纪金融学教材新系"教材编委会精心策划，在总结过去

教材建设经验的基础上,结合应用型本科教育的特点,借鉴国内外的经验做法,经过反复研究、论证和撰写,推出了这套金融学专业系列教材。这套系列教材包括《金融学》、《保险学》、《国际金融学》、《中央银行学》、《证券投资学》、《商业银行学》、《金融法学》、《行为金融学》、《金融工程学》、《理财学》、《金融市场学》、《金融英语》等十几种。

这套系列教材作为上海市金融保险本科教育高地的标志性教材和金融学专业人才培养的重要成果,具有五个方面的特点。第一,创新性。从培养学生的兴趣入手,以掌握方法论和创造性思维为主线,以知识、概念和理论为基石,进行总体设计,思路新颖,写作体例风格独特。第二,前瞻性。搜集了最新的数据资料和理论研究成果,使教材内容着力体现超前性、前沿性、动态性。第三,实践性。体现了实践型本科教学和金融学的专业特点,以提高学生竞争力、综合素质和社会适应能力为最终目标,适当增加国际先进专业资格认证考试的相关内容,如特许金融分析师、精算师、保险金融行业资格考试、金融风险管理师考试等。第四,系统性。基础知识、学科理论和政策体系融为一体,注重金融理论与金融应用的结合、金融改革与金融发展的结合、宏观金融与微观金融的结合、对内金融与对外开放金融的结合、历史金融与现实金融的结合。第五,可读性。突出"以学生为中心"的思想,强调学以致用,所用语言浅显易懂,并附有一定的案例分析。此外,编写教师的阵容庞大,起点高,教学经验丰富,研究能力强。

我们希望通过这套系列教材的推出,进一步锻炼教师队伍,提高教师素质和教学水平;同时,我们也希望通过这套教材的使用,不断探索金融学专业教学和科研的新路子,为金融学学科在中国的发展作出贡献。由于我们的理论水平和金融业务操作技能有限,这套系列教材必然会存在许多不足之处。希望通过这套系列教材的出版,与金融学界、政界以及从事金融业务工作的同仁共同研究和探讨,使我们进一步提高教材的编写水平,提高教学和人才培养质量。

丛书编写委员会

2010年5月

前　言

中国经济的迅猛发展已经引起了全球的关注，伴随着经济发展，金融建设也突飞猛进。上海国际金融中心建设是“十二五规划”的重要目标之一。国际金融中心的建设急需金融人才特别是双语金融人才。我校开展双语教学特别是“国际金融”课程的双语教学已有近十年的历史，许多教师通过多年的教学，从不适应用英语授课到逐渐熟悉英语授课，教学水平和能力也逐步提高。同时在教学过程中也积累了大量的宝贵经验。此教材的编写既是为了更好地配合专业课程的双语教学，也是对我们在多年的教学中累积的经验的系统总结。

虽然有关国际金融的英文原版教科书在这些年中已经出版了很多，但是我们在选择教材的时候往往非常困惑。这是因为有些教材难度较大，对一些理论的阐述过于深奥，许多章节的论述超出了本科学生应该掌握的范围，因而不太适宜本科学生学习；有些教材的系统性不够严密，微观和宏观夹杂阐述，不太符合我们认同的体系，我们认为该门课程基本上属于宏观的范畴；也有些教材侧重于理论阐述，对一些实务性较强的章节（例如外汇买卖等）缺乏例子，或者说例子太少，学生在理解方面会有一些困难。鉴于这些实际存在的问题，我们决定编写符合本科学生学习的这本国际金融教科书。此书的阅读对象为已学完宏观经济学和金融学等基础课程的大学二、三年级学生以及具有同等文化程度的自学者。

本书的特色首先是简单易懂，文字浅显、准确。对于理论的介绍除了文字叙述以外，尽量采用一些图表和公式，从而简化了一些比较难以理解的理论问题。教学实践告诉我们，有些看似简单的理论问题，学生仅通过文字解释来理解并不容易，但配合图形或公式效果会大不相同。我们相信图文并茂的形式对于自学读者也会有很大的帮助。

其次，全书篇幅紧凑，结构合理，逻辑性强。比起大部分的同类教科书，此书只有十一章，我们认为比较适合于学生在一个学期中全部学完。全书从宏观角度全面阐述国际金融的发生、发展以及涉及的理论问题和部分实务问题。对于一些外汇交易的实务介绍也有别于同类教科书，更加注重实例教学。

第三，全书的资料与数据新颖。本书所收集的资料、数据与理论研究成果都是最新的。我们的任务是综合这些研究成果，便利于学生掌握国际金融方面的最

新动态。

第四，为配合教学，本书为任课教师提供了丰富的教学辅助资料，如教学大纲、PPT讲义等。教学大纲中对教学重点、学时安排、教学内容等都有详尽的介绍。每章后面除了书上的概念题之外，另外还有一整套作业题以及答案。需要辅助教学资料的教师可以与复旦大学出版社联系(邮箱：fudanjiaocai@163.com，电话：021-65103503)。目前我们正在赶制教学视频，预计在2012年暑假之前可以完成，届时视频资料将公布在我校校园网的课程建设栏目下。

本书的结构大致总结如下：第一章导言阐述国际金融的发生、发展以及研究的主要内容。第二章研究国际金融的起因——国际收支，国与国之间经济与金融的交易是国际金融产生的直接原因，该章的重点是国际收支的主要内容以及国际收支与宏观经济变量的关系。第三章学习外汇市场，由于主权国家拥有各自不同的货币，国际经济、金融交易势必引起不同货币之间的兑换，外汇市场应运而生。第四章综述国际货币体系。从古典的金本位到20世纪中叶最重要的布雷顿森林体系以及其后的浮动汇率制度，再到目前多元化的汇率制度并存，对这些体系的发生、发展和消亡进行了简单的介绍，并且对两大汇率制度——固定与浮动汇率制度进行了扼要的比较。第五章介绍汇率决定的几个重要理论，如购买力平价理论、利率平价理论、远期平价理论以及费雪方程式等，重点是解释和比较这些理论之间的联系。第六章研究货币衍生品市场，主要是比较远期合约与期货合约，货币期权的基本概念和掉期交易的原理等，重点是如何利用衍生产品规避外汇风险。第七章简要介绍国际金融市场，如欧洲货币市场和欧洲债券市场。第八章和第九章学习国际收支调整理论，主要介绍弹性论、吸收论、货币论和资产组合平衡论，这些理论产生的背景和对现实的指导意义。第十章和第十一章是宏观经济学的延续，主要研究开放经济体的宏观经济政策，该两章主要参照Mundell-Fleming模型解释开放经济条件下的均衡收入、均衡利率和国际收支均衡，重点是宏观经济政策在固定汇率制度和浮动汇率制度方面的影响、作用以及区别。

本书是我们在双语教学上的一种尝试，在编写过程中得到了许多专家、教师的支持和指导，同时有不少学生也提出了许多宝贵的建议，在此深表谢意。由于时间仓促，错误与不妥之处在所难免，真诚希望读者谅解，也希望读者能及时指正。

姚迪克
上海金融学院国际金融系
2011.12

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CHAPTER 1
INTRODUCTION TO INTERNATIONAL FINANCE

LEARNING OBJECTIVES

- Examine the subject matter of international finance
- Know the environment of international finance, the recent development of world trade, the growth of the financial sector and the derivatives markets
- Consider the basic theory of comparative advantage in international trade
- Discover the benefits to study international finance
- Understand the structure of the book

Finance is an exciting word. Lots of students are interested in finance major, because they know (or their parents know) that people who work for financial institutions usually get higher pay. The word "international" is more fascinating. "International" is everywhere in our daily life. Today the international element in our lives is pervasive and virtually inescapable. If you look at your clothes closets, your kitchens, your living rooms, your dining rooms and your offices, you will find that many goods you use in your daily life are made in foreign countries or contain foreign components. Foreign goods and foreign countries still fascinate a lot of people here.

What does finance mean? It means the management of money (usually the public money) by governments, large firms or organizations etc. Another meaning of finance is provision of money when and where required. Since each country has its own currency, international finance is the management of money in an international environment.

This chapter discusses the subject matter of international finance. We'll

introduce the environment of international finance, i. e. the increasingly fast development of world trade and investment, and the financial markets as well. The gains from trade and the theory of comparative advantage will be discussed to show the need for international finance. The reasons to study international finance are also to be covered. Finally, we'll examine the structure of the book.

The Subject Matter of International Finance

International finance studies the monetary and macroeconomic relations among countries. International finance is a constantly evolving subject that deals greatly with real world issues such as balance-of-payments problems and policies, the causes of exchange rate movements and the implications of macroeconomic linkages between nations.

The balance of payments is one of the most important economic indicators for the government policy-makers in an open economy. It influences a country's employment rate, interest rate, exchange rate and many other economic variables. Over the past 10 to 15 years, America has run huge trade deficits with the rest of the world, especially China. The U.S. government increasingly accuses the Chinese government of manipulating RMB exchange rate. Why is the U.S government concerned about its trade deficits? Why does it continuously complain that the RMB is undervalued? What are the impacts of the balance-of-payments problems on its domestic economy? What should a government do to correct its balance-of-payments disequilibrium? These and other questions are all we try to answer in this book.

Foreign exchange rate is the core subject matter in the field of international finance. The adoption of floating exchange rate system in 1973 provoked controversies over the pros and cons of the system itself. Many new theories have been developed to explain the causes of exchange rate movements. Those theories try to explain the phenomena which have never existed before in international finance. China's currency RMB has had much larger increase in its value against the U. S. dollar since 2005. And China has allowed a somewhat faster rate of increase in recent years. While the foreign pressure may have had some effect, the most important reason that China's government has allowed faster appreciation of the RMB is that conditions in China's economy have

changed. With the double-digit economic growth rate the Chinese economy has also experienced an increasingly higher inflation rate in the last several years. The appreciation of the RMB can assist the government to tackle the overheating economy. We are going to introduce some old and new theories about foreign exchange rate in detail in this book.

One of the major developments in the past three decades has been the exponential growth in trading in derivative instruments such as currency futures, options and swaps. Financial derivatives provide valuable tools for the companies who face exchange risk exposures. On the other hand, they are also used extensively by authorities, mutual funds, pension funds or even banks for speculations. Therefore, financial derivatives are also the major concerns for regulatory authorities. Some economists believe that they are the major causes for 2008 worldwide financial crises.

The Environment of International Finance

International Economic Integration and Globalization

As the world becomes more integrated, countries become more interdependent. In today's world, no nation exists in economic isolation. All aspects of a nation's economy — its industries, service sectors, levels of income and employment, living standard — are linked to the economies of its trading partners. This linkage takes the form of so-called international economic integration and globalization. Indeed, in a highly globalized and integrated world economy national economic policies cannot be formulated without evaluating their probable impacts on the economies of other countries.

Economic integration refers to trade unification between different states by the partial or full abolishing of customs tariffs on trade taking place within the borders of each state. Complete economic integration would imply free trade in all goods and services, perfect capital mobility, complete freedom of migration, complete freedom of establishment for businesses, and an unhindered flow of information and ideas. It would also imply the elimination of national differences in taxation, in the financing of social services, in the rules governing competition and monopoly, and in environmental regulation; and arguably a single currency. Complete economic integration is clearly a very

distant prospect for the world as a whole, although it has been realized in such economic blocs as the EU and the NAFTA. Some further movement towards integration is widely considered desirable for countries with similar cultures; whether it is desirable at all where there are wide differences in culture is a matter of dispute.

Globalization includes market integration, world governance, global society and mobility of peoples and information. For any multinational corporation (MNC), global business is the social science of managing people to organize, maintain, and grow the collective productivity toward accomplishing productive goals, typically to maximize profit and value for its owners and stakeholders.

The world is becoming more and more a borderless world for economic transactions as a result of World Trade Organization negotiations to reduce trade restrictions, the continuing move by the EU toward a true United States of Europe with one currency, and trading arrangements such as the North American Free Trade Agreement uniting Canada, the United States, and Mexico into one large trading bloc. The trade pacts among the different countries have hastened the fall of international trade barriers. Here we briefly discuss the world's major trade pacts.

The World Trade Organization (WTO) is an international organization to supervise and ensure that world trade flows as smoothly, predictably and freely as possible. It evolved from the "General Agreement on Tariffs and Trade" (GATT). There are 153 members in WTO now.

North American Free Trade Agreement (NAFTA) is an agreement reached in 1993 between Canada, Mexico and the United States making the three countries into a "free trade" zone.

European Union (EU) was originally formed with twelve members. The former of EU was European Community (EC). There are 27 members in EU now. It is a single Europe-wide market so that people, goods, and money can move around freely, as if within one country. Sixteen members use the single currency — euro.

Association of South-East Asian Nations (ASEAN) is a political and economic group of the capitalist nations of South East Asia, formed in 1967 and comprising 10 countries: Brunei, Cambodia, Indonesia, Laos, Malaysia,

Burma (Myanmar), the Philippines, Singapore, Thailand, and Vietnam. While the organization is committed to strengthening economic ties, progress has been limited. There has also been political cooperation.

Asia-Pacific Economic Cooperation (APEC) is a forum for 21 Pacific Rim countries to promote free trade and economic cooperation throughout the Asia-Pacific region. Australia, Canada, China, Japan, Korea, Russia and the United States are among the member countries.

Southern Common Market (Mercosur) is an economic and political agreement between Argentina, Brazil, Paraguay and Uruguay. Bolivia and Chile are associate members. Founded in 1991, Mercosur aims to promote free trade and the fluid movement of goods, people, and currency. It is now a full customs union.

Andean Community is a customs union comprising the South American countries of Bolivia, Colombia, Ecuador, Peru, and Venezuela. In 1998 Andean Community and Mercosur signed an agreement for the creation of a free trade area. These countries are working with the UN Conference on Trade and Development (UNCTAD) to establish a Latin American common market.

Organization of Petroleum Exporting Countries (OPEC) is an intergovernmental organization of twelve developing countries — Algeria, Angola, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela. One of the principal goals of OPEC is the determination of the best means for safeguarding the organization's interests, individually and collectively. It also pursues ways and means of ensuring the stabilization of prices in international oil markets.

Commonwealth of Independent States (CIS) is a regional organization whose participating countries are former Soviet Republics, formed during the breakup of the Soviet Union. Member states include Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. The purpose is to promote trade, finance cooperation in the region.

Rapid Growth of World Trade in Goods and Services

The economic cooperation and trade pacts have made great contributions to the economic integration and globalization. The economic integration and

globalization have sped up the development of world trades and investments during the last several decades. Exports and imports as a share of national output have reached unprecedented levels for most industrial nations, while foreign investment and international lending have expanded more rapidly than world trade. International markets are integrated when assets sell for the same price in every country. In segmented markets, asset prices are not necessarily equal across markets because of the transaction costs, regulatory and institutional interferences, informational barriers and the immobility of labor. As barriers to trade progressively fall, foreign markets are playing an increasingly important role in the viability of domestic industries.

World trade of goods and services has expanded at a remarkable pace because of the reduction in trade barriers, lower transportation costs and advances in telecommunications, information technology and financial services. The annual growth rate from 1970 to 2010 reached an impressive six percent on average. **Figure 1.1** shows the growth in volume of world merchandise trade and GDP from 2000 to 2010. Developed economies recorded export growth of nearly 13% in 2010, compared to a 16.5% average increase in the rest of the world. China's exports increased in 2010 by a massive 28% in volume terms. It should be noted here that the average growth rate of world GDP was about 3.1% between 1990 and 2010.

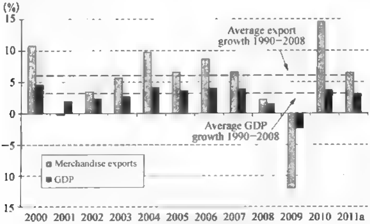

Figure 1.1 Growth in volume of world merchandise trade and GDP, 2000 - 2011 (Annual percentage change)

Figures for 2011 are projections
Source: WTO Secretariat

At the same time, the value of world imports increased by more than 5.8 times from $2,583.1 billion in 1990 to $15,050 in 2010. Both the developed and developing countries shared in the growth. **Exhibit 1.1** lists the annual average percentage change of world imports for selected regions and countries between 2005 and 2010. The United States was the leading importer in 2010, with purchases of $1.97 trillion from foreign providers, equal to 13% of world imports. It was followed by China ($1.4 trillion or 9% of world), Germany ($1.07 trillion or 7% of world), Japan ($693 billion or 4.5% of world), and France ($606 or 4% of world). The table shows the imports are also important for less or least developed economies.[①]

Exhibit 1.1 Growth in world merchandise import by selected regions and economies
(Annual % change)

	2010	2005－2010	2008	2009	2010
World	15,050	7	16	−23	21
North America	2,681	3	8	−25	23
U.S.	1,968	3	7	−26	23
Europe	5,841	5	13	−25	13
Germany	1,087	7	12	−22	15
France	606	4	13	−22	8
U.K.	558	2	2	−24	15
CIS	414	14	32	−33	24
Africa	463	13	28	−15	14
Asia	4,503	11	21	−20	32
Japan	693	6	23	−28	25
China	1,395	16	18	−11	39
LDCs *	174	15	30	5	13

* LDCs the least developed countries
Source: WTO secretariat

As measured by the share of overall real sector activity, world trade in

① WTO Press Releases (Press/628), "World Trade in 2010, Prospects for 2011", April 7, 2011.

goods and services has become increasingly more important to both developed and developing economies alike. **Figure 1.2** exhibits the world exports of goods and commercial services as a percentage to the overall real sector output (GDP). It shows that the global market for goods and commercial services in current U.S. dollars rebounded more quickly than world GDP in 2010, and as a result the ratio of world trade to GDP rose sharply after falling even more sharply in 2009. At 124 in 2010, it remained below its 2008 peak of 132, but the 2010 value was still high by historical standards. With the fast growth in international trade, growth in GDP was also stronger. GDP has grown faster in developing economies than in developed economies in recent years, especially in Asia and Africa.

Figure 1.2 Ratio of world exports of goods and commercial services to GDP, 1980 - 2010

Index, 2000 = 100

Source: IMF for world GDP, WTO Secretariat for world trade in goods and commercial services.

The Growth of the Financial Sector

The international trade and international investment have generated corresponding financial flows and it is now the rule rather than an exception that a firm must manage payments and receipts in currencies other than its own. Also we have witnessed a rapid integration of international capital and financial market in the last several decades. As a result, currency trading has recently undergone explosive growth. **The Bank for International Settlement (BIS)** has conducted **Triennial Survey** of foreign exchange and derivatives market activity every three years since April 1989. 53 central banks including U.S. Fed and People's Bank of China (PBOC) participated in 2010 survey. **Exhibit 1.2** is the

foreign exchange market average daily turnover in April, 2010. In the table, spot transactions, outright forwards and foreign exchange swaps were previously classified as part of the so-called "traditional foreign exchange market". The category "other products" covers highly leveraged transactions and other transactions whose notional amount is variable. Global foreign exchange market turnover was 167% higher in 2010 than in April 1998, with average daily turnover of nearly \$4 trillion compared with \$1.5 trillion.

Exhibit 1.2 Global foreign exchange market turnover by instrument
(Average daily turnover in April, in billions of U.S. dollars)

Instrument	1998	2001	2004	2007	2010
Foreign exchange instruments	**1,527**	**1,239**	**1,934**	**3,324**	**3,981**
Spot transactions	568	386	631	1,005	1,490
Outright forwards	128	130	209	362	475
Foreign exchange swaps	734	656	954	1,714	1,765
Currency swaps	10	7	21	31	43
Options and other products	87	60	119	212	207
Memo:					
*Turnover at April 2010 exchange rates*①	*1,705*	*1,505*	*2,040*	*3,370*	*3,981*
*Exchange-traded derivatives*②	*11*	*12*	*26*	*80*	*168*

Source: BIS: *Triennial Century Bank Survey of Foreign Exchange and Derivatives Market Activity in April, 2010*. September 2010

Furthermore, as international barriers to free capital movement have significantly been reduced or in some places totally disappeared, firms have sought to exploit their comparative financial advantage and diversify their sources of funds by borrowing internationally rather than limiting themselves to their own domestic market. Cross-boarder financing becomes

① Non-U.S. dollar legs of foreign currency transactions were converted into original currency amounts at average exchange rates for April of each survey year and then reconverted into U.S. dollar amounts at average April 2010 exchange rates.

② FOW TRADEdata; Futures Industry Association; various futures and options exchange. Reported monthly data were converted into daily averages of 20.5 days in 1998, 19.5 days in 2001, 20.5 days in 2004, 20 in 2007 and 20 in 2010.

more and more popular for **Multinational corporations** (MNCs). For reasons of market access and productivity, many firms have also embarked on programs of direct investment in foreign countries, with all the risks that this entails.

In the meantime, the monetary and financial markets are increasingly important for both developed and developing countries. In December 2010, the total outstanding debt securities of the whole world were $27,664 billion. The developed countries issued $24,078 billion debts; a 16% increase compared with $20,775 billion at the end of 2008. The developing countries' total outstanding debts in December 2010 were increased by 28% from $901 billion in 2008 to $1,149 billion at the end of 2010①. The financial sector's size and share in value added have increased over time, especially in developed economies. In the United States, Canada and Australia this share has almost doubled since 1980, reaching 8% in 2009. The sector's growth in Europe and Japan was 6% at the same time. (See Figure 1.3)

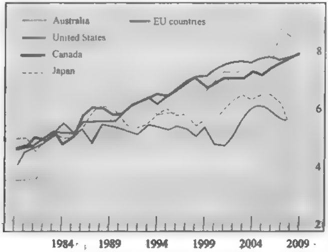

Figure 1.3 Size of the financial sector (Value added*)
In percent

* As a share of total value added in the economy
Sources: Datastream; national data

① BIS locational and consolidated international banking statistics. *BIS Quarterly Review*, March 2011.

The integration and globalization of the world economy lead to the growth in international business of the financial institutions. Multi-currency lending and borrowing is commonplace. International lending whether conducted from the home office, or by local affiliates in foreign countries, or via international hubs — has trended upwards as a share of banks' total lending to non-banks. **Figure 1. 4** presents the share of foreign lending in developed economies. For European banks, this share has grown strongly over the past five years, and currently stands at more than one third. Partly because of their larger domestic economies, Japanese and U. S. banks channel abroad less than 15% of their lending.

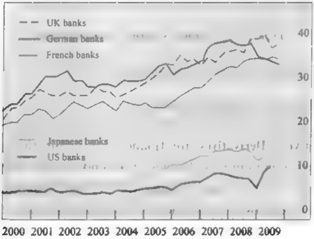

Figure 1. 4 Share of foreign lending in developed economies
In percent

Sources: IMF, BIS International banking statistics

Non-bank borrowers' reliance on foreign banks has varied across national economies but has been generally substantial. **Figure 1. 5** shows that the countries in emerging Europe obtain more than 80% of their bank borrowing from banks headquartered abroad. At the other end, borrowers in Japan depend on international lenders for just 5% of their financing. In between, foreign banks account for roughly one quarter of overall bank credit in the United Sates and EU countries. And contrary to conventional wisdom that foreign banks play a larger role in emerging countries, their share in emerging Asian economies is less than 20%.

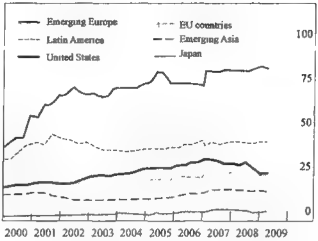

Figure 1.5 Borrower's reliance on foreign banks
In percent

Sources: IMF; BIS International banking statistics

The Creation of Financial Derivatives

The competition in the financial market spurs the creation of vast array of financial derivatives. **Derivatives** are financial contracts that are designed to create market price exposure to changes in an underlying commodity, asset or event. They were created to help manage the evolving risk-return profile. The 1980s have seen an explosion in the number of markets trading financial futures and options. Today the size of derivatives markets by some measures exceeds that for bank lending, securities and insurance. All these derivative products are being traded on a worldwide basis because the underlying instruments are being traded on a worldwide basis. They offer both definite opportunities and a distinct disadvantage to anyone involved in international trade or finance — exporters, importers, professional investors, company treasurers, bankers and portfolio managers if he is not familiar with the products that are available and how they can be used.

In addition to risk management, derivatives markets play a very useful economic role in price discovery. **Price discovery** is the way in which a market establishes the price or prices for items traded in that market, and then disseminates those prices as information throughout the market and the economy as a whole. In this way market prices are important not only to those

buying and selling but also to those producing and consuming in other markets and in other locations and all those affected by commodity and security price levels, exchange rates and interest rates. The price discovery process gives rise to the public interest concern, and historically it has been the motivation for the regulation of derivatives markets in the United States. Along with these economic benefits come costs or potential economic costs. Some firms, banks or even local governments have run up enormous losses either through a lack of understanding of the instruments or the taking of unduly risky positions. Long-Term Capital Management collapsed \$1.4 trillion in derivatives on their books. In the process it froze up the U.S. dollar fixed income market. Barings bank was quickly brought to bankruptcy by over a billion dollars in losses from derivatives trading. Both the Mexican financial crisis in 1994 and the East Asian financial crisis of 1997 were exacerbated by the use of derivatives to take large positions involving the exchange rate.

The Theory of Comparative Advantage

Classical economist Adam Smith was a leading advocate of free trade on the grounds that the free trade promoted the international division of labor. According to Smith, mutually beneficial trade requires each nation to be the least-cost producer of at least one of its goods that it can export to its trading partner. All countries benefit from free trade by specializing in the goods that they are best suited to produce because of natural or acquired advantages. In this case, if country A can produce cars more efficiently than country B while country B can produce wheat more efficiently than country A, country A will specialize in producing cars and country B will specialize in producing wheat. Then two countries can get what they want through trade. Total output of the two goods is higher than it would be if they both allocated resources to the less efficiently produced goods. This theory assumes that every country has at least one product with an absolute advantage that can be exported in exchange for the other goods it needs to import. But what if country A is more efficient than country B in the production of both wheat and cars? The 19th-century British economist David Ricardo developed a theory called "comparative advantage" to show that economic well-being is enhanced even when one nation is absolutely

more efficient in the production of all goods.

For an example of the benefits of free trade based on comparative advantage, assume that U. K. is more efficient than France at producing both wheat and cars. With one unit of input (a mix of land, labor, capital, and technology), efficient U. K. can produce either 24 units of wheat or 12 units of cars. France can produce only 20 units of wheat or 4 units of cars with one unit of input. These production capabilities are as follows:

	Production Capability	
	Units of wheat	Units of cars
U. K.	24	12
France	20	4

If there is no trade between U. K. and France, each country divides its own inputs between wheat and cars. Assume both countries select to allocate 300 inputs to wheat and 700 inputs to cars, total output for each country is shown in **Exhibit 1.3**.

Exhibit 1.3 Production of U. K. and France before trade

	Wheat Production (unit)	Car Production (unit)
U. K.	300 × 24 = 7,200	700 × 12 = 8,400
France	300 × 20 = 6,000	700 × 4 = 2,800
Total output	**13,200**	**11,200**

The combined output is 13,200 units of wheat and 11,200 units of cars. Without trade, each country can consume only what it produces.

One unit of input in U. K. has an absolute advantage over an input unit in France in both wheat and cars. Nevertheless, France has comparative advantage over U. K. in producing wheat. Note that in using units of production, France can "trade off" one unit of production needed to produce 20 units of wheat for 4 units of cars. Thus, a unit of cars has an opportunity cost of 20/4 = 5 units of wheat, or a unit of wheat has an opportunity cost of 4/20 = 0.2 units of cars. Analogously, U. K. has an opportunity cost of 24/12 = 2 units of wheat per unit of cars, or 12/24 = 0.5 units of cars per unit of wheat. That is to say, France's opportunity cost for producing wheat (0.2) is less than U. K.'s (0.5); while U. K.'s opportunity cost for producing cars (2) is less than

France's (5). Thus, it is clear that U. K. is relatively more efficient in producing cars and France is relatively more efficient in producing wheat.

According to Ricardo, U. K. has comparative advantage in producing cars (lower opportunity cost) than France's and France has comparative advantage in producing wheat. Therefore, U. K. produces only cars while France produces only wheat. Total output would be higher for both wheat and cars, as shown in **Exhibit 1.4**.

Exhibit 1.4 Specialization in U. K. and France

	Wheat Production (unit)	Car Production (unit)
U.K.	0	1,000×12 = 12,000
France	1,000×20 — 20,000	0
Total output	**20,000**	**12,000**

Both U. K. and France are now better off in terms of total output. The problem now is how to distribute those two goods between the two countries. Suppose the "exchange rate" is 4 units of wheat to 1 unit of cars. Now Britain exports 3,200 cars to France for 12,800 units of wheat from France. In other words, U. K. now can consume 5,600 units of wheat more than before (12,800--7,200 = 5,600), and France can consume more cars than before. The situation would be as shown in **Exhibit 1.5**.

Exhibit 1.5 Trade at a price of 4 units of wheat to 1 unit of car

	Wheat Production (units)	Car Production (units)
U.K.	12,800 (import)	12,000−3,200 = 8,800
France	20,000 12,800 = 7,200	3,200 (import)

This is an important result. Both countries have become richer because of trade even though one country has an absolute advantage in the production of both goods. Even though this is a simplified model, it shows a very important issue in international finance: How do we determine the trade ratio, i. e. the exchange rate of wheat versus cars?

For example, if the ratio is not 4 units of wheat to 1 unit of cars, instead it is 2 to 1. In this case, U. K. must export 3,600 units of cars for 7,200 units of

wheat. U.K.'s consumption is just as it was with no trade. U.K. will gain nothing from trade although it will lose nothing.

In essence, the exchange ratio of wheat and cars is the exchange rate of two different currencies since U.K. uses pound and France uses euro. The exchange rate of pound and euro is a finance issue. The two sectors in an economy, the real sector and financial sector are closely linked together. The **real sector** produces goods and services the real wealth of a society while the financial sector facilitates trade and settlement. The **financial sector** functions like a lubricant to make trade run more smoothly and easily.

The Benefits of Studying International Finance

Since we are living in a highly globalized and integrated world economy, it is clear that modern financial management and investment is international in scope and requires the corresponding knowledge and expertise in order to be successful. The emergence of trans-national production networks is reshaping the relationship between foreign direct investment and international trade. The expansion of the MNC has reached unprecedented level since the late 1960's. Exhibit 1.6 lists the top 20 of the largest 100 MNCs ranked by the size of foreign assets. The United Nations Conference on Trade and Development (UNCTAD) compiles the list every year in its "World Investment Report". Many of the firms on the list are well-known MNCs with household names because of their presence in consumer product market. For example, General Electric, Royal/Dutch Shell, Toyota, Honda, Siemens, Ford, Volkswagen and BP are names recognized by most people. Most of the top 100 multinational corporations are from developed countries such as U.S., U.K., Germany, France and Japan.

Exhibit 1.6 The top 20 MNCs ranked by foreign assets, 2008 (millions of U.S. dollars)

Ranking by Foreign Assets	Corporation	Country	Assets		Sales	
			Foreign	Total	Foreign	Total
1	General Electric	U.S.	401,290	797,769	97,214	182,515
2	Royal/Dutch Shell Group	U.K.	222,324	282,401	261,393	458,361
3	Vodafone Group Plc	U.K.	201,570	218,955	60,197	69,250

Continued

Ranking by Foreign Assets	Corporation	Country	Assets		Sales	
			Foreign	Total	Foreign	Total
4	BP PLC	U.K.	188,969	228,238	283,876	365,700
5	Toyota Motor Corp.	Japan	169,569	296,249	129,724	203,955
6	ExxonMobil Corp.	U.S.	161,245	228,052	321,964	459,579
7	Total SA	France	141,442	164,662	177,726	234,574
8	E. on	Germany	141,168	218,573	53,020	126,925
9	Electricite De France	France	133,698	278,759	43,914	94,044
10	ArcelorMittal	Luxembourg	127,127	133,088	112,689	124,936
11	Volkswagen Group	Germany	123,677	233,708	126,007	166,508
12	GDF Suez	France	119,374	232,718	68,992	99,377
13	Anheuser-Busch Inbev SA	Netherlands	106,247	113,170	18,699	23,558
14	Chevron Corporation	U.S.	106,129	161,165	153,854	273,005
15	Siemens AG	Germany	104,488	135,102	84,322	116,089
16	Ford Motor Company	U.S.	102,588	222,977	85,901	146,277
17	Eni Group	Italy	95,818	162,269	95,448	158,227
18	Telefonica SA	Spain	95,446	139,034	54,124	84,778
19	Deutsche Telekom AG	Germany	95,019	171,385	47,960	90,221
20	Honda Motor Co. Ltd.	Japan	89,204	120,478	80,861	99,458

Source: World Investment Report 2009 (UNCTAD)

A financial manager of an MNC with operations in more than one country encounters new opportunities as well as new costs and risks. The primary goal of any firm is to maximize shareholder wealth. The challenge facing the multinational financial manager is to successfully develop and execute business and financial strategies in more than one culture or business environment. Reaching that goal - maximizing profits — requires combining three critical elements. The first is that an MNC should have the ability to compete in an

open marketplace in which labor, capital and technology are moved freely without restrictions. The second is that the MNC should have high quality strategic management. To be able to recognize and develop investment opportunities in foreign markets, the multinational financial manager must understand the capabilities and limitations of traditional investment analysis, have a plan of attack for entry into and exit from foreign markets, and value the growth and abandonment options presented by foreign markets. The third is that the successful MNC should gain ready access to affordable capital. The access to the capital is so important that it allows the investment needed to obtain the technology, execute the strategy, and expand across global markets. The financial opportunities of the MNC are richer than those of the domestic corporation because of cross-border differences in investors' required returns and hence the corporation's cost of capital. Multinational financial management requires a thorough knowledge of the international markets in interest rates and foreign currency, as well as derivatives markets in interest rate and currency futures, options, and swaps. In many ways, today's financial manager must be a jack-of-all-trades as well as master of one finance.

Specifically, the knowledge of international finance can help a financial manager of a multinational corporation in the following two aspects:

- It helps the manager decide how international events will affect a firm and what steps can be taken to exploit positive developments and insulate the firm from harmful ones.
- It helps the manager to anticipate events and to make profitable decisions before the events occur.

Events include changes in exchange rate, interest rate, and inflation rate and asset values. They all have impacts on a company's profits, investment decisions and returns. Jobs, bond and stock prices, food prices, government revenues and other important economic variables are all tied to exchange rates and other developments in the global financial environment.

All in all, an understanding of multinational financial management is crucial to success in today's marketplace, and equally essential in tomorrow's marketplace. This is unquestionably true for firms competing directly with foreign firms, such as a domestic auto industry in competition with international automakers. It is also true for domestic firms whose suppliers, customers, and

competitors are increasingly likely to be from foreign countries. In today's business environment, the success of firms in service and manufacturing industries depends on their ability to recognize and exploit imperfections in national markets for both products and factors of production and work effectively within the political and economic constraints imposed by foreign governments.

Book Structure

This book is designed for junior or senior undergraduates majoring in finance. It can also be used by students and professionals lacking in up-to-date training in modern financial theory. The basic principles, models and techniques of finance and investment are explained and illustrated with examples as they arise. It is very important for students to understand the material presented in this textbook. So at the end of each chapter there are conceptual questions summarizing the key ideas discussed in that chapter. Since great changes have taken place in the modern financial market and the market changes almost every day, we need to know these changes. Therefore, we hope students should often read financial papers and magazines or visit the relative websites to be kept informed. It is not an easy task to fully master all the theories and practices of international finance by just reading this textbook.

This book is divided into four parts. Part I (Chapters 1, 2, 3, and 4) introduces the subject matter of international finance and new environment of modern international finance. We then discuss the balance of payments which is one of the causes for the international finance. Since the foreign exchange rate is the core subject of the international finance, we focus a lot on foreign exchange rate. In Chapter 3 we learn the basics of foreign exchange rate and market. The topics include the function of foreign exchange market, spot and forward exchange rate, exchange rate quotation, foreign exchange arbitrage, types of foreign exchange rates such as cross rates, nominal and real exchange rate, and effective exchange rate. Chapter 4 introduces the exchange rate systems that prevailed in the history, such as international gold standard, Bretton Woods system, floating exchange rate system, and various other kinds of the system adopted by nations worldwide today. Part II consists of three

chapters. Chapter 5 focuses on several important exchange rate theories and international parity conditions. They are the exchange rate determination under floating exchange rate system, purchasing power parity, interest rate parity, Fisher equation, forward parity, Fisher open, real interest parity and so on. Chapter 6 analyzes the financial derivatives, mainly currency futures, options and swaps. Chapter 7 introduces the international financial markets including the Eurocurrency market and Eurobond market. Part III (Chapters 8 and 9) studies the theories of balance-of-payments and exchange rate determination. Part IV (Chapters 10 and 11) explains the macroeconomics in an open economy, and government policy implications for economic activities.

Summary

1. International finance is the management of money in an international environment. It studies the monetary and macroeconomic relations between countries.
2. The subject matter of international finance includes mainly balance-of-payments problems and policies, the causes of exchange rate movements and the implications of macroeconomic linkages between nations.
3. The financial environment has undergone a profound change over the past four decades. Economic integration and globalization are the main stream in today's world economy.
4. Economic integration means a nation's economy is linked to the economies of its trading partners. In an integrated market, all asset prices are necessarily equal across every county.
5. Globalization includes market integration, world governance, global society and mobility of peoples and information.
6. World economic cooperation and free trade pacts have hastened the development of world trade and investment. WTO, NAFTA, EU, to just name a few, have greatly changed our life and also changed the way people do businesses and make investments.
7. The growth in the international business of financial firms has contributed not only to global economic integration but also to the spillover of stress across borders. International lending has trended upwards as a share of

banks' total lending to non-banks.

8. Financial derivatives are created to manage risks involved in international trade and investment. They also play an important economic role in price discovery.
9. Financial derivatives bring economic benefits as well as costs. Some firms, banks or even governments have run up huge losses either through a lack of understanding of the instruments or by unduly taking some risk positions.
10. Classical economists Adam Smith and David Ricardo presented a theory to show free trade benefitting both countries. The theory of comparative advantage indicates that mutually beneficial trade can occur even when one nation is absolutely more efficient in the production of all goods.
11. The real sector of an economy creates real wealth of a society while the financial sector facilitates the trade and settlement.
12. Three conditions are the MUST for a successful MNC to maximize profits: open marketplace, strategic management, and access to capital.
13. The knowledge and expertise in international finance helps a financial manager of a multinational corporation decide how international events will affect a firm and what steps can be taken to exploit positive developments and insulate the firm from harmful ones. It also helps the manager to anticipate events and to make profitable decisions before the events occur.
14. An understanding of multinational financial management is crucial to success in today's and tomorrow's marketplace.

Key Terms

Absolute advantage (绝对优势)
Bank for International Settlement (BIS) (国际清算银行)
Comparative advantage (比较优势)
Economic integration (经济一体化)
Financial derivatives (金融衍生产品)
Financial sector (金融部门)
Globalization (全球化)
International finance (国际金融)
Multinational Corporation (MNC) (跨国公司)

Price discovery (价格发现)

Real sector (实体部门)

Triennial survey (三年一次的调查，指国际清算银行每三年对外汇交易量的调查报告)

World Trade Organization (WTO) (世界贸易组织)

Questions

1. What is international finance?
2. What is the subject matter of international finance?
3. What do economic integration and globalization mean? What are the differences between the two?
4. What is one of the characteristics of a segmented market?
5. List the causes of rapid growth in international trade and international capital movements.
6. What is the trend of international finance?
7. Are financial derivatives necessary? Why?
8. What are the harmful aspects of the financial derivatives?
9. What is price discovery?
10. Use your own words to describe the theory of absolute advantage.
11. What is the difference between the real sector and financial sector?
12. Why should we learn international finance?
13. What is the goal of financial management? How might the goal of financial management be different for the multinational corporation from that for the domestic corporation?
14. In order to maximize shareholder wealth, what are basic conditions required for a multinational corporation?
15. Define and explain the theory of comparative advantage.

CHAPTER 2
THE BALANCE OF PAYMENTS

LEARNING OBJECTIVES

- Learn how nations record their economic transactions with the rest of the world and the functions of the balance of payments
- Identify each account and subaccount in the balance of payments
- Understand the principle guiding balance-of-payments structure, what transaction should be recorded as a credit entry or a debit entry, and how the double-entry bookkeeping system works
- Know the meaning of a balance-of-payments surplus or deficit and the meaning of each subaccount surplus or deficit
- Discover the macroeconomic meaning of the current account
- Examine the economic relationships between current account and capital and financial account in the balance of payments

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One of the most important economic indicators for governments in an open economy is the balance of payments (BOP). The BOP statistics often captures the news headlines and can become the focus of attention. A country's BOP reveals the country's economic transactions with the rest of the world. Because cross-border economic and financial flows affect economic performance, such as output and employment, and financial variables, such as interest rates and exchange rates, it is important for financial decision makers to understand how this process occurs.

This chapter shows what the BOP is and what it means to the policy-makers. We begin with a general presentation of the BOP and the major transactions to which it refers. We examine the principles guiding its structure

and the interpretation of each type of transaction that is included. Particular attention is paid to the fact that the BOP always balances, meaning that it always comes out to zero. We'll examine what is meant by the notion of a BOP surplus or deficit. In the later chapters we consider the role of the monetary authorities and the different ways that this balance can be achieved. We will also look at the functional relationship between the balance of payments and the overall economy.

Definition of the Balance of Payments

A country uses the BOP statistics to track its cross-border flow of goods, services, and capital. The **balance of payments** is the record of the economic and financial flows that take place over a specified time period between residents and non-residents of a given country. The International Monetary Fund (IMF) compiles statistics on each country's cross-border transactions and publishes a monthly summary of BOP statistics, although it is a common practice for most countries to supply BOP data on an annual basis.

To precisely understand this definition, we first need to be able to identify who is a resident and who is a non-resident. **Resident** is defined to include all economic units domiciled in the reporting country. **Non-resident** is anyone who is not domiciled in the reporting country. It is important to note that citizenship and residency are not necessarily the same thing from the viewpoint of the BOP statistics. The term residents of a country comprise the general government, individuals, private non-profit bodies serving individuals, and enterprises, all defined in terms of their residential relationship to the territory of that country. Usually, any individual or firm who works or lives in a country for more than one year, no matter what nationality they are, would be regarded as the resident of that country. For the purposes of BOP statistics, the subsidiaries of a multinational corporation are treated as being a resident in the country in which they are located even if their shares are actually owned by domestic residents. A foreign student who studies in a domestic school is regarded as the domestic resident. Some exceptions regarding the resident are international organizations such as the International Monetary Fund, the World Bank, United Nations and so forth. These institutions are treated as being non-residents even though they

may actually be located in the reporting country. Foreign embassies and foreign military bases are also in this category. For example, although U.S. embassy in Beijing is located in Beijing, salaries paid by the embassy to the Chinese staffs are included in China's balance of payments because they are regarded as transactions with a non-resident. Tourists are regarded as being non-residents if they stay in the reporting country for less than a year.

The criterion for a transaction to be included in the BOP is that it must involve a transaction between a resident of the reporting country and a non-resident of that country. Purchases and sales between residents from the same country are excluded.

Second, BOP reflects **economic and financial flows** which are the international transactions in goods, services and financial assets or liabilities. Each of the following examples is a typical international transaction that is counted and recorded in China's balance of payments.

- A Beijing car dealer imports 50 Porsche Panamera from a German automobile distributor.
- The Chinese subsidiary of a U.S. firm, Hewlett-Packard, pays dividends back to its parent firm in California.
- A Chinese tourist purchases a Canon camera in Tokyo, Japan.
- The Chinese government provides a low interest rate loan to North Korea.
- China National Petroleum issues company stocks in New York Stock Exchange.

It should be noted that the BOP just tracks the continuing flows of purchases and payments between a country and the rest of the world, and it does not add up the value of all assets and liabilities of a country on a specific date like a balance sheet does for an individual company.

The balance of payments provides detailed information of the demand and supply of a country's currency. The balance-of-payments statistics also shows a country's performance in international economic competition. Therefore, the BOP is one of the most important statistical statements for any country. It reveals how many goods and services the country has been exporting and importing and whether the country has been borrowing from or lending money to the rest of the world. In addition, whether or not the central bank has added to or reduced its official reserves is reported in the statement. The BOP data

influences and is influenced by other key macroeconomic variables such as gross domestic product, employment levels, price levels, exchange rates, and interest rates. Governments take the data into account at the national level when they are making monetary and fiscal policies. Business managers and investors need the BOP data to anticipate changes in economic policies that might be driven by BOP events. Later in this chapter we'll analyze the relationship between BOP and macroeconomic variables in detail.

Balance of Payments Accounting

All trades conducted by both the private and public sectors are accounted for in the BOP in order to determine how many foreign currencies are going in and out of a country. If a country has received foreign currencies, this is known as credit, and, if a country has paid or given foreign currencies, the transaction is counted as a debit. Theoretically, the BOP should be zero, meaning that assets (credits) and liabilities (debits) should balance. But in practice this is rarely the case and, thus, the BOP can tell the observer if a country has a deficit or a surplus and from which part of the economy the discrepancies are stemming.

In theory, a so-called double-entry bookkeeping system is employed to record all economic and financial flows. A **double-entry bookkeeping system** records both sides of any two-party transaction with two separate and offsetting entries: a debit entry and a credit entry. An international transaction that results in a credit entry would also generate an offsetting debit entry, and a transaction that results in a debit entry would also generate an offsetting credit entry. In other words, every credit (debit) is matched by a debit (credit) somewhere to conform to the principle of double-entry bookkeeping system. The result is that the sum of all the debit entries, in absolute value, is equal to the sum of all the credit entries. That is, with everything in, the country's balance of payments always "balances".

A **debit entry** records a transaction that results in a domestic resident making a payment abroad. A debit entry has a negative value in the BOP statistics. A **credit entry** records a transaction that results in a domestic resident receiving a payment from abroad. A credit entry has a positive value in the BOP

statistics.

Before considering some examples of how different types of economic transactions between residents and non-residents get recorded in the BOP, we need to consider the various accounts that make up the BOP. The BOP is divided into three main categories: the current account, the capital and financial account and the official reserves account. Each general account is then subdivided into categories such as exports, imports, direct investment, portfolio investment, etc. When necessary, even more detail is available. In *Balance of Payments Statistics*, for example, the IMF regularly publishes member countries' balance of payments data divided into 112 different categories.

Accounts of the Balance of Payments

Current Account

The current account is used to mark the inflow and outflow of goods and services into a country. Earnings on investment such as stocks (in the form of dividends), both public and private, are also put into the current account. The last component of the current account is unilateral transfers. These are items including worker's remittances, which are salaries sent back into the home country of a national working abroad, as well as foreign aid, gifts and grants. The current account consists of four subaccounts:

Goods Trade includes raw materials and manufactured goods that are bought, sold or given away (possibly in the form of aid). It is also called merchandise trade which represents exports and imports of tangible goods. The value of goods exports is recorded in the credit side (plus sign) of the BOP, and the value of goods imports is recorded in the debit side (minus sign). Combining the exports and imports of goods gives the goods trade balance or **balance of trade (BOT)**. The BOT is typically the biggest bulk of a country's BOP as it makes up total imports and exports. When this balance is negative, the result is BOT deficit, meaning the country imports more than exports merchandise. The BOT surplus, on the other hand, means that the country's exports exceed imports.

Services Trade refers to payments and receipts from tourism, transportation, engineering and business service fees (from lawyers or management consulting,

for example), insurance premium on movable goods during the course of shipment between countries as well as on the carriers themselves and other types of insurance such as life insurance, property insurance, and royalties from patents and copyrights. The services trade is sometimes called invisible trade. The services exports are credit items and services imports are debit items. For the major industrial countries, this subaccount has shown the fastest growth in the past decade.

Investment Income reflects receipts and payments of interest, dividends and profits from investment. Income receipts represent the rewards for investment in overseas companies, bonds and equity, while payments reflect the rewards to foreign residents for their investment in the domestic economy. Therefore, income receipts received by domestic residents are credits, whereas income payments made to foreign residents are debits.

Unilateral Transfers are receipts and payments for which there is no corresponding compensation except goodwill in return. This subaccount can be further divided into private and government unilateral transfers. Examples of unilateral transfers are migrant workers' remittances to their families back home as well as gifts, inheritances, and prizes, funds provided by the government to aid in the development of a less-developed country, the payment of pensions to non-residents, contributions to international organizations and so forth.

This completes the components of the current account. For most countries the current account is dominated by the balance of trade, which is the balance of export and import of merchandise. The BOT is widely quoted in the business press in most countries. For developed countries, the BOT is somewhat misleading, in that services trade is not included.

The following five examples of the current account transactions will show you how BOP accounting works.

Transaction 1: goods export

Suppose a Chinese exporter sells 2,000 T-shirts to a Wal-Mart store in Newark, New Jersey. The price of the T-shirts is \$20,000. China's BOP will show a credit or a source of \$20,000 of exports.

We mentioned earlier that balance of payments accounting is based on a

double-entry bookkeeping system. A credit or source of \$20,000 implies a debit or use of an equal amount. Suppose the Wal-Mart store pays for the T-shirts through Citigroup in New York. Now the Chinese exporter has a short-term claim of \$20,000 on the Citibank. Expressed in T-accounts China's BOP will look like this:

Export	
Debit(−)	Credit(+)
	\$20,000

Short-term claims	
Debit(−)	Credit(+)
\$20,000	

Transaction 2: goods import

A Shanghai retailer buys \$300,000 worth of laptops from Sony in Japan. The merchandise is billed in U. S. dollars and the retailer pays for the merchandise with a check drawn on Bank of China, Shanghai Branch.

In this case, the computer import represents an increase in China's tangible assets and is a use of external purchasing power. The check drawn by the Chinese retailer on a Shanghai branch of Bank of China represents an increase of short-term liabilities owed by a Chinese resident to a non-resident and is a source of external purchasing power. For China's BOP expressed in T-accounts, this transaction will appear as follows:

Imports	
Debit(−)	Credit(+)
\$300,000	

Short-term liabilities	
Debit(−)	Credit(+)
	\$300,000

From Transactions 1 and 2 we can calculate China's trade balance for the period which is equal to:

$$\begin{aligned} \textit{Balance of trade} &= \text{Exports} - \text{Imports} = \$20{,}000 - \$300{,}000 \\ &= -\$280{,}000 \end{aligned}$$

Transaction 3: travelling expenses (service export)

Mr. Williams, an American, decides to go to China for his three-week vacation. He buys a round trip ticket on Air China for \$2,500. His expenses in China for hotels, food, transportation and souvenirs come to the equivalent of \$15,000. He pays the ticket in cash with dollars and obtains the RMB equivalent of \$15,000 that he spends in China by selling dollars to a Chinese bank.

The \$2,500 that Mr. Williams pays Air China will be credited to passenger services in the balance of payments and the \$15,000 that he spends in China will be credited to travel for a total of \$17,500 of exports of services for Chinese economy. On the other hand, Air China increased its cash dollar holdings by \$2,500 while the Chinese bank increased its cash dollar holdings by the \$15,000 for a total increase of \$17,500 for Chinese economy. For China's BOP expressed in T-accounts, these transactions will appear as follows:

The service export generates a source of \$17,500 worth of external purchasing power. This is offset by an increase of \$17,500 worth of cash dollar holdings in the account "short-term claims".

Service Exports		Short-term claims	
Debit(−)	Credit(+)	Debit(−)	Credit(+)
	\$17,500	\$17,500	

Transaction 4: income

Hewlett-Packard in Shanghai, a wholly owned Chinese subsidiary of the HP in California, has after-tax profits of the equivalent of \$100,000 and declares a dividend of \$50,000. The California headquarters uses the dividend to purchase long-term bonds issued by the Shanghai municipal government.

As a wholly owned subsidiary, HP Shanghai represents a direct investment for HP California. Therefore, a total profit of \$100,000 including retained earnings and the declared dividend is counted as investment payment for China's BOP and a use of external purchasing power. Since the HP Shanghai declares only half of its profits as dividend, it implies that the company will retain the other half. Therefore, the rest \$50,000 will be used as reinvestment by the HP Shanghai. The non-distributed profits or retained earnings of \$50,000 represent an increase in HP's direct investment in China. HP California is a US resident enterprise and, hence, Chinese residents' liabilities on non-residents have increased by \$50,000. By the same token, the long-term government bonds purchased by HP California with the dividend represent a \$50,000 increase in non-resident portfolio investment. In T-accounts for China's BOP, these transactions will be recorded as follows:

Investment Income

Debit(−)	Credit(+)
$ 100,000	

Direct Investment

Debit(−)	Credit(+)
	$ 50,000

Portfolio Investment

Debit(−)	Credit(+)
	$ 50,000

Transaction 5: unilateral transfer

Mr. Wang, who is a Chinese citizen but has been a resident of the United States for several years, transfers $ 10,000 from his account at a New York branch of Citicorp to his mother's account at Bank of China, Shanghai Branch. There is no commercial quid pro quo involved in the operation. Thus, the transaction falls under the heading "immigrant worker's remittance" and represents a unilateral transfer and a source of external purchasing power for Chinese economy. The offsetting use of external purchasing power is the increase in Bank of China's short-term claims to the Citibank. These transactions will be recorded in China's BOP as follows:

Private Unilateral Transfers

Debit(−)	Credit(+)
	$ 10,000

Short-term claims

Debit(−)	Credit(+
$ 10,000	

Exhibit 2. 1 presents all the information resulting from Transactions 1 through 5. Although we were considering transactions related to the current account, the double — entry system made it necessary to consider transactions related to the capital and financial account as well. As we can see, at the end of Transaction 5 China has a current account deficit of $ 352, 500. This deficit was offset by a $ 352,500 surplus in the capital and financial account. In fact, because of the double-entry bookkeeping system, the balance of the current and capital and financial accounts will always be equal to zero. The importance of this fact will become clear when we analyze the effects of BOP transactions on other economic and financial variables. We can complete the presentation of BOP accounting by taking a close look at the capital and financial account.

Exhibit 2.1 China's balance of payments after transaction 5 (U.S. dollar)

Current account	
+Exports	20,000
−Imports	−300,000
= **Trade balance**	= **−280,000**
+Service exports	17,500
−Service imports	—
+Investment income (credit)	—
−Investment income (debit)	−100,000
+(−) Private unilateral transfers	10,000
+(−) Official unilateral transfers	—
= **Current account balance**	**−352,500**
Capital and financial account	
+(−) Direct investment	50,000
+(−) Portfolio investment	50,000
+(−) Other short-term capital	252,500
+(−) Net errors and omissions	—
+(−) Change in reserves	—
= **Capital and financial account balance**	= **352,500**

Capital and Financial Account

The **capital and financial account** are where all international capital transfers are recorded. This account was traditionally called the capital account. According to the International Monetary Fund, the **capital account** now refers to the acquisition or disposal of financial and non-financial assets (for example, a physical asset such as land, building or machinery) and non-produced assets, which are needed for production but have not been produced, like a mine used for the extraction of diamonds. This account has been introduced as a separate component in the IMF's balance of payments only recently.

The **financial account** records the net value of flows of financial assets and similar claims (excluding official reserves flows). The credits and debits of the financial account transactions are like exports and imports of goods

and services. For example, if a non-resident buys Chinese financial assets, China is exporting financial assets. The transaction is viewed as a credit entry from the Chinese perspective. If a Chinese resident purchases stocks from the New York Stock Exchange, China is importing financial assets. The transaction is then viewed as a debit entry. The financial account is broken down into three subaccounts: direct investment, portfolio investment and other investment.

Direct investment includes inflows and outflows of direct investment capital such as equity capital, reinvested earnings, and intercompany transactions between affiliated enterprises. If a U. S. company builds a factory in China, this is a foreign direct investment in China. Since the capital flows into our country, the transaction enters the credit side of China's BOP. If a U. S. company takes a majority stake in a company in China, it is also regarded as a direct investment. When residents of one country acquire a controlling interest (stock ownership of 10% or more) in a foreign firm, it is a direct investment. Whenever 10% or more of the voting shares in a Chinese company are held by foreign investors, the company is classified as the Chinese affiliate of a foreign company, and as a foreign direct investment. Similarly, if Chinese investors hold 10% or more of the control in a company outside China, that company is considered the foreign affiliate of a Chinese company.

Portfolio investment is the capital invested in activities that are purely profit-motivated. It includes cross-border transactions associated with long-term debt and equity securities, money market instruments, and derivative instruments. As mentioned in the discussion of investment income, the difference between direct investment and portfolio investment revolves around whether or not the investor intends to take an active role in the management of the enterprise the assets of which are being acquired. In many cases there is no ambiguity. Bonds, debentures and the like are clearly portfolio investment insofar as they confer no management or voting rights on their owners.

Other investment groups all the capital transactions that have not been included in direct investment or portfolio investment. It consists of various short-term and long-term loans, foreign currency deposits, and trade credits. These investments are quite sensitive to both changes in relative interest rates

between countries and the anticipated change in the exchange rate. If China's interest rate is higher than other countries' and the value of RMB is expected to be up, China will experience capital inflows, as investors would like to deposit or invest in China to have higher returns.

In **Exhibit 2.1** we can see that although there was no net movement in the long-term capital account, there was a surplus of $252,500 in the short-term capital account. In transaction 1 short-term claims increased when the Chinese exporter extended a $20,000 trade credit to the U.S. importer. In transaction 2 short-term liabilities increased when the Japanese exporter accepted the $300,000 check drawn on the Bank of China. In transaction 3 short-term claims increased when Air China and the Chinese bank accepted $17,500. Finally, in transaction 5 short-term claims increased when the Bank of China, Shanghai Branch accepted the $10,000 sight deposit at the New York Branch of Citicorp. The difference shows a surplus of $252,500 in the other short-term capital subaccount.

Transaction 6: direct investment

An affiliate of Volkswagen in China has net profit of $250,000. The VW headquarters decides to reinvest it. The VW affiliate in China is a resident of China, but the VW headquarters is the non-resident. When VW does not take the profit and reinvest it, it makes the direct investment to China. This is the example of retained earnings which are regarded as the direct investment. It is a foreign direct investment in China which is recorded in the credit side of China's BOP. The offsetting use of the external purchasing power is the increase of China's short-term claims to the foreigner.

Direct Investment		Short-term claims	
Debit(−)	Credit(+)	Debit(−)	Credit(+)
	$250,000	$250,000	

Transaction 7: portfolio investment

A Chinese buys $50,000 Dell computer's equity. He pays for the stocks with his bank deposits in New York Bank. The transaction represents the capital outflows out of China. This is the China's portfolio investment to the U.S. For China's BOP, it will be recorded as follows:

Portfolio investment

Debit(−)	Credit(+)
$50,000	

Short-term liabilities

Debit(−)	Credit(+)
	$50,000

Official Reserves Account

A key element in international economic and financial analysis is the amount of international liquidity or "reserves" held by the central authority of individual countries. If a country's payments to the foreigners exceed receipts from the foreigners, the country's central bank should either run down its official reserve assets, or borrow reserve assets from foreign central banks. Thus, **official reserves** are financial assets that could be used to settle international debts and claims. It includes monetary gold, special drawing rights (SDRs), the reserve position in the Fund and foreign exchanges. Monetary gold is gold held by the authorities as a financial asset. SDRs are reserves created by the IMF as bookkeeping entries and credited to the accounts of IMF member countries according to their established IMF quotas. They may be used in the settlement of balance of payments imbalances among countries participating in the Special Drawing Account administered by the IMF. More will be discussed about SDRs and IMF when we introduce the international monetary system. The reserve position in the Fund is basically the difference between the member's quota plus other claims on the Fund less the Fund's holdings of that member's currency. Foreign exchanges are major currencies used in international trade and financial transactions, and by far the largest component of total international liquidity. It includes monetary authorities' claims on non-residents in the form of bank deposits, treasury bills, short-term and long-term government securities, and other claims usable in the event of balance of payments need, including non-marketable claims arising from inter-central bank inter-governmental arrangements, without regard to whether the claim is denominated in the currency of the debtors or the creditors.

This account differs from the other accounts in the balance of payments insofar as it is the only account that records transactions with residents as well as non-residents. Let's look at a transaction with a non-resident.

Transaction 8: reserves transaction

The People's Bank of China pays $1 million to buy U.S. treasury bonds

from the Federal Reserve Bank, the US central bank.

The People's Bank of China is the central bank so the transaction must be recorded in the official reserves account. The PBOC claims on non-residents decrease by \$1 million through this transaction. A decrease in assets is a source. Thus, *a reduction of international reserves represents a source of external purchasing power*. It is worth taking some time to think about this operation because our experience has been that, based on intuition, the contrary would seem to be true. The corresponding use of external purchasing power comes about through the possession of the U. S. government bonds, which is China's portfolio investment in the U. S. The following T-accounts record these transactions:

Change in reserves

Debit(−)	Credit(+)
	\$1,000,000

Portfolio investment

Debit(−)	Credit(+)
\$1,000,000	

The following transaction involves the central bank with a domestic resident. This transaction should be recorded on BOP because the result of this transaction changes the official reserves of PBOC.

Transaction 9: reserves transaction with a resident

Bank of Communication sells \$800,000 to the PBOC for RMB. In this transaction, claims on non-residents by Bank of Communication decrease by \$800,000. The corresponding use is the \$800,000 increase of the PBOC's foreign exchange reserves. These transactions are recorded as follows:

Change in reserves

Debit(−)	Credit(+)
\$800,000	

Short-term claims

Debit(−)	Credit(+)
	\$800,000

Exhibit 2.2 summarized China's balance of payments after the conclusion of Transaction 9. The current account has not changed. It is still in deficit by \$352,500. The capital and financial account has changed. The direct investment subaccount has increased by \$250,000. The portfolio investment subaccount has moved from a surplus of \$50,000 to a deficit of \$1 million due to the purchase of U. S. government bonds by PBOC. The short-term capital

subaccount balance now is $852,500. The official reserves account has gone from zero to a deficit of $200,000 due to the reduction in foreign exchange holdings. When it comes to analyzing a country's external position, it is important to look at the individual accounts to see how the balance between the current and the capital and financial accounts is achieved.

Exhibit 2.2 China's balance of payments after transaction 9

Current account	
+Exports	20,000
−Imports	−300,000
= *Trade balance*	−280,000
+Service exports	17,500
−Service imports	—
+Investment income (credit)	—
−Investment income (debit)	−100,000
+(−) Unilateral transfers (private)	10,000
+(−) Unilateral transfers (government)	—
= Current account balance	**−352,500**
Capital and financial account	
−Direct investment	—
+Direct investment	300,000
+(−) Portfolio investment	−1,000,000
+(−) Other long-term capital	—
+(−) Other short-term capital	852,500
+(−) Net errors and omissions	
= Capital and financial account balance	**152,500**
Official reserves account	
+(−) Change in reserves	+200,000
= Official reserves account balance	**+200,000**

Net Errors and Omissions

The double-entry bookkeeping system is employed in theory, but not in

practice. In reality, there is not a system available whereby officials can simultaneously record the credit side and debit side of each transaction. Current and financial entries are collected and recorded separately. Thus, there will be serious discrepancies between debits and credits. Officials collect information from multiple sources that vary in coverage and reliability. For example, merchandise trade figures are derived from customs records and freight charges from reports by shipping organizations. Service transactions such as the consulting fees can easily escape detection. Capital and financial account information is derived from reports by financial institutions indicating changes in their liabilities and claims to foreigners; these data are not matched with specific current account transactions. Short-term capital movements are particularly difficult to track, especially when there is intent to evade exchange controls, taxes and other restrictions. Capital movements may also lead or lag the transactions they are meant to finance. For example, an export shipped in the month of November or December may not be paid for until January or February of the following year. For those reasons, the balance of payments always presents a "balancing" debit or credit as net errors and omissions. The net errors and omissions account ensures that the BOP actually balances because it offsets the cumulated net difference in the other accounts.

Interpretation of Balance of Payments

Exhibit 2.3 is a simplified version of U. S. balance of payments in 2010. The Bureau of Economic Analysis (BEA) under the U. S. Department of Commerce reports the BOP statistics each quarter during the year. We selected major items from the BEA complete version when we compiled this simplified version. It should be pointed out that the present U. S. balance of payments includes just two main accounts: the current account and the capital and financial account. The official reserves account is just a subaccount of the financial account. In order to make it consistent with our introduction of the BOP accounts, we separate the official reserves account from the financial account.

Exhibit 2.3 U.S. balance of payments, 2010 ($ million)

Current Account	
(1) Exports of goods and services	1,834,166
(1.1) Goods	1,288,663
(1.2) Services	545,503
(2) Imports of goods and services	−2,329,893
(2.1) Goods	−1,935,740
(2.2) Services	−394,153
(3) Investment income, net	162,974
(4) Unilateral transfers, net	−137,489
Balance on current account (1)+(2)+(3)+(4)	-470,242
Capital and Financial Account	
(5) Capital account transactions, net	150
(6) Financial account	236,785
(6.1) Direct investment abroad	−345,621
(6.2) Direct investment from abroad	194,464
(6.3) Portfolio investment assets	−167,150
(6.4) Portfolio investment liabilities	481,824
(6.5) Other investment liabilities	73,268
Capital and financial account balance (5)+(6)	236,935
(7) Statistical Discrepancy	235,141
Official Reserves Account	
(8) U.S. official reserve assets	−1,834
(8.1) Gold	0
(8.2) Special drawing rights	−31
(8.3) Reserve position in IMF	−1,293
(8.4) Foreign currencies	−510
Basic balance (1)+(2)+(3)+(4)+(5)+(6)+(7)	1,834

Source: Bureau of Economic Analysis, U.S. Department of Commerce, "U.S. International transactions, 2009 and 2010", news release, April 2011

If we add all the account balances in Exhibit 2.3 up, we'll see the result is zero. BOP always balances since each credit in the account has a corresponding debit elsewhere. So what does BOP deficit or surplus mean? However, while the overall BOP always balances this does not mean that each of the individual accounts that make up the BOP is necessarily in balance. For instance, the current account of the 2010 U. S. balance of payments was negative, \$470.242 billion; the capital and financial account had a surplus of \$236.935 billion. When talking about a BOP balance, economists use the following measure to refer to BOP deficit or surplus. That is:

Current account (CA) + Capital and financial account (KA) = 0 (BOP balance)

Current account (CA) + Capital and financial account (KA) > 0 (BOP surplus)

Current account (CA) + Capital and financial account (KA) < 0 (BOP deficit)

The balance of current account and capital and financial account is also referred to as the **basic balance**. When the balance of payments is said to be in surplus or deficit, it is the basic balance that is actually in surplus or deficit. For the 2010 U.S. balance of payments, the current account deficit was \$470.242 billion and the capital and financial account surplus was \$236.935 billion. It seems that the U.S. had BOP deficit of \$233.307 billion. But the statistical discrepancy was \$235.141 billion in the credit side, which means some transactions were not reported or omitted when the statistics were made. Adding those two figures up, we find the 2010 U.S. BOP had a surplus of \$1,834 (236.935 + 235.141 − 470.242) which exactly matched the official reserves account balance.

Therefore, there is another way to measure whether the BOP is in surplus or deficit. If a country increases its official reserves during the reporting period, the country runs the BOP surplus and vice versa. As can be seen from the Exhibit 5.3, the official reserves account balance is \$1,834 billion showing the increase of official reserves, the BOP thus runs the surplus.

BOP surplus indicates a country can make more foreign currencies than spend them or the country's income from the rest of the world exceeds its payments to the rest of the world. The surplus nation may either finance the

rest of the world or increase its official reserves.

BOP deficit implies that the country's receipts from the rest of the world are less than the payments made to the rest of the world. The country may reduce its official reserves or borrow from the rest of the world.

Now let's examine some individual accounts balance. **Trade balance** measures a country's merchandise exports and imports. If a nation exports more than imports, the nation runs surplus in its trade balance; if a nation exports less than imports, the nation runs deficit in its trade balance.

A **current account surplus** means that the country as a whole is increasing its stock of claims on the rest of the world; while a **current account deficit** means that the country is reducing its net claims on the rest of the world. The United States has had trade deficit and current account deficit in the last 20 years. The trade balance and current account balance derive much of their importance because estimates are published on a monthly basis by most developed countries. The next two sections in this chapter we will see the current account can readily be incorporated into economic analysis of an open economy. More generally, the current account is likely to quickly pick up changes in other economic variables such as changes in the real exchange rate, domestic and foreign economic growth and relative price inflation.

For capital and financial account, **surplus** in this account implies that the country has net capital inflows. There are two reasons that a country may have capital inflows. One is that that nation probably has current account deficit, and it has to borrow from abroad to finance its current consumption. However, the burden of repaying the borrowed funds may reduce the nation's future prosperity. The other reason is that foreign investors may think the country's economic environment is good for investment. That kind of capital inflows is good for the country. The United States has generally run a large current account deficit because of the deficit in the trade balance. However, because the United States is considered a safe haven economy, i.e., a nation with little political risk, large inflows of foreign investments create a surplus in the capital and financial account of the U.S. balance of payments. **Capital and financial account deficit** means that the reporting country has a net capital outflows. In this case, the country may have current account surplus. For example, Japan has generally had a large current account surplus because of that country's large

merchandise trade surplus. However, the surplus is used to invest large amounts in foreign countries in plant and equipment, real estate, and other investments. Thus, their capital account may run a large deficit.

The capital and financial account balance is sometimes confused with the balance of international indebtedness. At any particular moment, a country will have a fixed stock of assets and liabilities against the rest of the world. The statistics that summarize this situation are known as the **balance of international indebtedness**. It is a record of the **international investment position** of the country at a particular time (usually the end of an accounting year). The capital and financial account balance, on the other hand, reflects the flows of assets and liabilities of the reporting country with the rest of the world within a period of time. Flows change stocks, so it is with the balance of payments and the international investment position.

If a country has a current account surplus for the year, the country increases its foreign assets (or decreases its foreign liabilities). The value of its international investment position at the end of that year will be more positive (or less negative) than it was at the beginning of the year.

If the stock of a country's foreign financial assets is more than the stock of foreign-owned domestic financial assets, the nation is called a **net creditor**; if a nation's foreign financial asset stocks are less than stocks of foreign-owned domestic financial assets, the nation is called a **net debtor**. As shown in Exhibit 2.4, the United States was a net creditor before 1986. After that, it turned out to be a net debtor because of the large current account deficits. The persistent deficits in current account required the U. S. to finance by increasing international borrowing.

Exhibit 2.4 U.S. international investment position at the end of selected years, 1985 – 2009 (U.S. $ billion)

	1985	1986	1990	1995	2000	2005	2007	2009
U.S.-owned assets abroad	1,287	1,469	2,179	3,486	6,239	11,962	18,340	18,379
Private	1,080	1,238	1,920	3,225	6,025	10,506	15,409	14,380
Direct investment	371	405	617	886	1,532	2,652	3,553	4,051
Others	709	833	1,303	2,339	4,493	7,854	11,856	10,329

Continued

	1985	1986	1990	1995	2000	2005	2007	2009
U.S. government (nonofficial)	90	92	84	85	85	78	94	83
U.S. official reserve assets	118	140	176	176	128	188	277	404
Foreign-owned assets in U.S.	1,226	1,497	2,409	3,916	7,576	13,894	20,256	21,117
Direct investments	247	285	505	680	1,421	1,906	2,411	2,673
Others	979	1,212	1,904	3,236	6,155	11,988	17,845	18,444
Net Investment Position of the U.S.	61	-28	−230	−430	−1,337	−1,932	1,916	−2,738

Source: Bureau of Economic Analysis, "International Investment Position of the United States at Yearend, 1976 - 2009"
(www.bea.gov/international/xls/intinv09_t1/xls)

The terms net creditor and net debtor in themselves are not particularly meaningful. We need additional information about the specific types of claims and liabilities involved. The balance of international indebtedness therefore depends on the short and long-term investment positions of both the private and government sectors of the economy.

Of what use is the balance of international indebtedness? Perhaps of greatest significance is that it breaks down international investment holdings into several categories so that policy implications can be drawn from each separate category about the liquidity status of the nation. For the short-term investment position, the strategic factor is the amount of short-term liabilities (bank deposits and government securities) held by foreigners. This is because these holdings potentially can be withdrawn at very short notice, resulting in a disruption of domestic financial markets. The balance of official monetary holdings is also significant. Assume that this balance is negative from the U.S. viewpoint. Should foreign monetary authorities decide to liquidate their holdings of U.S. government securities and have them converted into official reserve assets, the financial strength of the dollar would be reduced. As for a nation's long-term investment position, it is of less importance for the U.S. liquidity position because long-term investments generally respond to basic economic trends and are not subject to erratic withdrawals.

The Current Account and the Macroeconomics

A country's balance of payments affects and is effected by nearly all of its key macroeconomic variables. One of them is the gross domestic product (GDP). As we know, an economy's consumption and investment of resources cannot be greater than the resources that it produces plus the resources that it borrows. It therefore implies that the entire BOP of a single country is and must be always balanced. If a country's BOP is in disequilibrium, it actually means the country's basic balance is imbalanced. Now let's examine the relationship between the current account balance and the macroeconomic performance.

The Current Account and the Net Foreign Investment

The main categories of the current account are exports and imports of goods and services plus the investment income. If a country can produce more than it spends, the country possibly has current account surplus. When the country has current account surplus, it earns extra assets or reduces liabilities in its dealings with other countries. Since the BOP must balance, the surplus country can either increase its official reserves or finance the rest of the world. In other words, the surplus country increases its foreign investment in the rest of the world. If a country runs current account deficit, the country can produce less than it spends. To finance the deficit, it must pay by giving up assets or increasing its liabilities. In that case, the country reduces foreign investment in the rest of the world or, and the rest of the world increases investment in the deficit country. If we define the **net foreign investment** (I_f) as the difference between the increased foreign financial assets and the increased foreign financial liabilities, the current account could be regarded as the net foreign investment. That is:

$$CA = I_f \qquad (2.1)$$

where

CA: a country's current account balance

I_f: a country's net foreign investment

If Equation 2.1 is negative, it indicates that the reporting country's foreign

liabilities exceed its assets abroad during the reporting period because of the current account deficit. If it is positive, the country's total investment abroad is greater than foreign investment in the reporting country because of the current account surplus.

In macroeconomics, the investment is linked to saving. Since the current account balance is related to the foreign investment, it is also related to the national saving. The national saving can be used for either domestic investment (I_d) or foreign investment (I_f). As we know, one of the equilibrium conditions for a nation's economy is that national saving equals investment. It is expressed algebraically as:

$$S = I_d + I_f \text{, or equivalently,}$$

$$I_f = S - I_d \tag{2.2}$$

Substitute Equation (2.2) for Equation (2.1) in I_f

$$CA = S - I_d \tag{2.3}$$

where

S: national saving

I_d: domestic investment

In other words, the country's current account balance equals national saving that is not invested at home. The current account surplus means that the national saving exceeds domestic investment; the extra saving then looks for other places to invest. The current account deficit means that domestic saving is not enough for domestic investment; the domestic economic entity must borrow from the rest of the world to meet its investment need.

The Chinese economy has experienced tremendous growth since the early 1980's. The current account of China's BOP had accumulated huge surplus during the period. One of the reasons for the huge current account surplus was China's high savings rate relative to domestic real investment rate. The current account surplus is also the most important reason for China's astonishing increase in foreign exchange reserves which have already surpassed \$3 trillion.

On the other hand, the perennial U. S. current account deficit resulted from the low domestic saving and high domestic real investment. The U. S. then relied on foreign funds to eliminate the deficit. Some countries including China have been running large trade surpluses with the United States but

reinvesting these funds in U. S. securities so the U. S. had equally large surpluses in the financial account.

The Current Account and the National Income

The current account is also linked to national income identity in macroeconomics. The equilibrium condition for a nation's economy is that its total income equals total output. The total output is distributed to the following groups:

$$Y = C + I_d + G + X - M \tag{2.4}$$

where

Y: total output of goods and services

C: domestic consumption

I_d: domestic investment

G: domestic government spending

X: exports

M: imports

Since the exports and imports of goods and services dominate the current account in most countries, $(X - M)$ represents the current account (CA). Rearranging equation 2.4 we get:

$$CA = Y - (C + I_d + G) \tag{2.5}$$

Here, Y is the total output of goods and services; $(C + I_d + G)$ represents the country's total expenditure. Therefore a country's current account balance is the difference between its domestic production of goods and services and its total expenditures on goods and services.

An important aspect of this identity is that the current account balance is a macroeconomic phenomenon: It reflects imbalances between the total output and total expenditure. BOP surplus means that a country's total output is greater than its total expenditure; while BOP deficit indicates that a country's total output is less than its total expenditure. The country thus needs to import from the rest of the world to satisfy its extra demand. It is obvious that deficit country has to cut its expenditure or increase its total output to overcome the BOP deficit. This is a very important theory of the BOP adjustment and exchange rate determination. We'll discuss this theory in detail in Chapter 8.

From equations (2.1), (2.3) and (2.5) we can conclude our analysis as follows:

Current account balance (CA)

= Net foreign investment (I_f)

= The difference between national saving and domestic investment ($S-I_d$)

= The difference between domestic product and domestic expenditure ($Y-E$)

We can use those identities to explain why a nation runs current account surplus or deficit. Assume a country has surplus in its current account balance. First, the country has an excess of exports over imports of goods, services, investment income, and unilateral transfers. The country's net foreign investment is positive which means the country is acting as a net lender to or investor in the rest of the world. Second, the country is saving more than it is investing domestically. The country becomes a net supplier of funds to the rest of the world. Third, the country is producing more (and has more income from this production) than it is spending on goods and services. It is able to export more goods and services to the rest of the world.

The opposite is true for a country with a current account deficit: the deficit country is a net foreign borrower; its domestic saving is less than domestic investment, and the country with BOP deficit is spending more than production (or income).

The Economic Relationships between Current Account and Financial Account

We have already known from the above discussion that the current account transactions are usually linked to capital flows. The basic economic and accounting relationship of the BOP is the inverse relation between the current and financial accounts. This is because according to double-entry bookkeeping system, the current account and financial account should be offsetting. Countries with large account deficits are "financed" through equally large surpluses in the financial account, and vice versa. Now we reexamine the relationship of the current account balance and financial account balance from the national income identity in macroeconomics.

National income has three possible uses; it can be spent on current

consumption, it can be saved (private savings), and we pay taxes to the government.

$$Y = C + S + T \tag{2.6}$$

where

Y: national income

C: consumption

S: savings

T: taxes

From the previous discussion, national income equals to the total output, or GDP (equation 2.4), therefore,

$$C + S + T = C + I_d + G + CA \text{, or}$$

$$CA = S - I_d - (G - T) \tag{2.7}$$

Now let's examine the national savings (S) which can be used for different ways. First, national savings can be used to invest domestically (I_d). Individuals buy domestic securities such as company bonds, stocks and other financial or non-financial products. Firms purchase investment goods to produce consumption goods. Second, individuals or enterprises use their savings to purchase government bonds which represent the government debts (G − T). Third, national savings can also be used to buy foreign securities and assets (I_f) which are categorized as foreign investment. Therefore,

$$S = I_d + (G - T) + I_f \tag{2.8}$$

where

I_d: domestic investment

$(G - T)$: government debts

I_f: the net foreign investment (domestic residents' purchases of foreign assets in excess of foreign residents' purchases of domestic assets)

Then, by rearrangement equation (2.8), we get:

$$I_f = S - I_d - (G - T)$$

We know that the net foreign investment (I_f) equals current account balance (CA) from the previous discussion. So,

$$CA = I_f = S - I_d - (G - T) \tag{2.9}$$

In other words, national savings less domestic investment and less the fiscal balance (government debt) equals the current account balance, which also equals the net foreign investment.

Suppose a nation's domestic savings rate is 10.4 percent of its total output, its private investment rate is 8.5 percent, and its fiscal budget deficit is 5.3 percent, what is the nation's current account balance and what should the nation do to balance its current account?

Applying equation 2.9, we get the current account balance:

$$CA = I_f = 10.4\% - 8.5\% - 5.3\% = -3.4\%$$

In other words, this nation's residents must borrow from the rest of the world ($I_f = -3.4\ \%$ of its GDP) to finance their investment expenditure and government debts, resulting in a current account deficit in the amount of 3.4 percent of total output.

Summary

1. The balance of payments is the record of the economic and financial flows that take place over a specified time period between residents and non-residents of a given country.
2. Balance-of-payments accounting is based on the double-entry bookkeeping system which records both sides of any two-party transaction with two separate and offsetting entries: a debit entry and a credit entry.
3. A debit entry records those transactions that result in a domestic resident making a payment abroad. A credit entry, on the other hand, records the transactions that result in a domestic resident receiving a payment from foreign residents.
4. The main accounts in the balance of payments are current account, capital and financial account and official reserves account. The current account includes exports and imports of goods and services, investment income and unilateral transfers. The capital and financial account includes capital account, direct investment, portfolio investment and other long and short-term capital movements. The official reserves account shows the changes in official reserves. The errors and omissions account captures the unreported

or omitted transactions. This account ensures that the BOP actually balances.

5. If there are no changes in a country's official reserves within the reporting period, the country's BOP balances in that period of time. If a country increases its official reserves, the country is said to have BOP surplus; or if a country decreases its official reserves, the country runs BOP deficit.
6. Increase in official reserves must be recorded as a debit entry and decrease in official reserves must be recorded as a credit entry.
7. The official reserves account is the only account that records transactions with residents as well as non-residents.
8. Another measure of BOP balance is the sum of current account and capital and financial account. If the sum is zero, the BOP balances; if the sum is negative, the BOP is in deficit; if the sum is positive, the BOP is in surplus. This balance is also known as basic balance.
9. The balance of payments of a country changes that country's international investment position which refers to the stocks of a country's international assets and liabilities at a point in time. It is also called international indebtedness.
10. A country's international indebtedness is changed every year by the flows of private and official funds measured in the balance of payments.
11. If the stock of a country's foreign financial assets is more than the stock of foreign-owned domestic financial assets, the nation is called a net creditor; if a nation's foreign financial asset stocks are less than stocks of foreign-owned domestic financial assets, the nation is called a net debtor. The United States has switched from being the world's largest net creditor to being the largest net debtor since the middle of 1980s.
12. When a country has a current account surplus, it has positive net foreign investment (that is, the country is acting as a net lender to or investor in the rest of the world); or, it is saving more than it is investing domestically; or, it is producing more (and has more income from its production) than it is spending on goods and services.
13. If a country runs current account deficit, the country is a net foreign borrower; or its domestic saving is less than domestic investment; or it is spending more than production (income).
14. A country's domestic saving is linked to the country's current account

through the following identity: $CA = S - I_d - (G - T) = I_f$. It means that the current account has a surplus only if the domestic investment plus the government debt do not exceed the domestic saving. Otherwise, the current account will be in deficit.

Key Terms

Balance of international indebtedness (Balance of international investment position) (国际借贷,国际投资状况平衡表)

Balance of payments (BOP) (国际收支)

Balance of payments deficit (国际收支逆差)

Balance of payments surplus (国际收支顺差)

Balance of trade (BOT) (贸易差额)

Basic balance (基本差额)

Capital and financial account (资本与金融账户)

Credit entry (贷方)

Current account (经常账户)

Debit entry (借方)

Double-entry bookkeeping system (复式簿记制度)

Direct investment (直接投资)

Economic and financial flows (经济与金融流量)

Errors and omissions (错误与遗漏)

Goods trade (货物贸易)

Investment income (投资收入)

Net creditor (净债权人)

Net debtor (净债务人)

Net foreign investment (净国外投资)

Official reserves (官方储备)

Official reserves account (官方储备账户)

Portfolio investment (indirect investment) (证券投资,间接投资)

Residents and non-residents (居民与非居民)

Services trade (劳务交易)

Special drawing rights (SDR) (特别提款权)

Unilateral transfers (单方转移)

Questions

1. What is balance of payments? What is balance of trade?
2. Distinguish the residents and non-residents. Indicate its importance in terms of BOP.
3. Explain the economic and financial flows recorded in a country's BOP.
4. What are the two main types of economic activity measured by a country's BOP?
5. What are the main component accounts of the current account? Give one debit and one credit example for each component account for the European Union.
6. What is the difference between a direct foreign investment and a portfolio foreign investment? Which type of investment is a multinational industrial company more likely to make?
7. What is balance of international indebtedness? What is the difference between balance of international indebtedness and BOP?
8. Explain the meaning of BOP surplus and deficit.
9. How can you know that a country runs BOP deficit from its official reserves account?
10. If domestic monetary authority purchases gold from domestic financial institutions, where is the transaction recorded?
11. Why does the BOP always balance?
12. If a country's domestic saving exceeds domestic investment, will the country run BOP deficit or surplus?
13. What does the current account surplus mean to Chinese economy?
14. Why is the U. S. government concerned about the U. S. current account deficit?
15. How is the current account linked to financial account?

CHAPTER 3
FOREIGN EXCHANGE RATE AND MARKET

LEARNING OBJECTIVES

- Understand the basics of foreign exchange and the market, including the function of the foreign exchange market, foreign exchange rate and quotation, and the spot and forward exchange market
- Examine the size, characteristics, structure, and participants of the foreign exchange market
- Explore the bid and ask rates, cross rates and currency arbitrage especially the triangular arbitrage
- Study the risk exposure in international trade and investment and the need for forward exchange market
- Examine various exchange rate definitions and their economic significance, particularly the nominal, real and effective exchange rate

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The foreign exchange is described as the life blood of international trade and investment. Most international financial transactions sooner or later involve an exchange of one currency for another. This is why the exchange rate and exchange rate determination play such an important role in international financial theory. This chapter lays the foundation for much of the discussion throughout the remainder of the text. It is critical to understand the contents of this chapter clearly and thoroughly.

The foreign exchange market allows one currency to be exchanged for another. The spot foreign exchange market is a market for immediate exchange. The forward market is where buyers and sellers agree to exchange

currencies at some specified date in the future. In this chapter, we first examine how the foreign exchange market as a whole is organized, what are the main functions of the foreign exchange market, who are the main participants in this market and so on. We then study the spot exchange market, the exchange rate quotations, the cross exchange rates and the foreign exchange arbitrage. We'll discuss the forward exchange market and the use of forward market as a hedging strategy. Finally, we describe different exchange rates such as nominal exchange rate and real exchange rate, effective exchange rate and so on.

Foreign Exchange Market

Foreign Exchange, Exchange Rate and Market

Foreign exchange is simply another country's money. American dollar is foreign exchange to any other countries' people except for the American people. British pound is foreign exchange to all the residents living outside Great Britain. Within China, any money denominated in any currency other than the RMB is, broadly speaking, "foreign exchange". Foreign exchange takes the form of cash, funds available on credit cards or debit cards, traveler's checks, bank deposits, checks and drafts or other short-term claims. But, in the foreign exchange market described in this book, foreign exchange transactions almost always take the form of an exchange of bank deposits of different national currency denominations. The foreign exchange can also be defined as the act of trading different countries' moneys. The most important character of the foreign exchange is its convertibility; that is, foreign exchange could be converted into any of the other currencies. The main convertible currencies in the world are U. S. dollar, British pound, Japanese yen, and Euro. Those currencies are widely used in international trade and financial transactions.

The **exchange rate** is simply the price of one currency in terms of another. For example, \$1 = SFr0.95 is the price of one U.S. dollar in terms of Swiss franc. Equivalently, SFr1 = \$1/0.95 = \$1.0526, that is the price of one Swiss franc in terms of the U.S. dollar. The dollar exchange rate refers to the dollar price in terms of other currencies; the RMB exchange rate is the price of

Chinese yuan expressed by other currencies.

The **foreign exchange market** is where currencies are bought and sold. The market provides the physical and institutional structure through which foreign exchange transactions are physically completed. The foreign exchange market serves two main functions. The first is to convert the currency of one country into the currency of another. The second is to provide some insurance against foreign exchange risk, by which we mean the adverse consequences of unpredictable changes in exchange rates. Without the foreign exchange market, international trade and international investment on the scale that we see today would be impossible; companies would have to resort to barter. The foreign exchange market is the lubricant that enables companies based in countries that use different currencies to trade with each other.

Size, Characteristics and Structure of the Foreign Exchange Market

The foreign exchange market is by far the largest financial market in the world. It has been growing at a rapid pace, reflecting a general growth in the volume of cross-border trade and investment. In March 1986, the average total value of global foreign exchange trading was about $200 billion per day. By April 1995, it was more than $1,200 billion per day. By April 2004 it had grown to $1.88 trillion. As of 2010, nearly $4 trillion are traded in this market on a daily basis. This is several times the level of turnover in the U.S. government securities market, the world's second largest financial market. **Figure 3.1** illustrates the Bank for International Settlement surveys for foreign exchange daily turnover between 1998 and 2010. The expansion in foreign exchange turnover reflects the continuing growth of international trade and the prodigious expansion in global finance and investment during the recent decades. The rapid increase in internationalization of financial activity also contributed to the enormous expansion in foreign exchange turnover.

Maybe it is difficult to comprehend how large the $4 trillion daily turnover is. Now let's take some examples so that you can compare. The U.S. GDP is about $15 trillion in 2010. According to the daily turnover of nearly $4 trillion, less than four days foreign exchange trading volume will surpass the total value of the U.S. goods and services produced in an entire year. China's

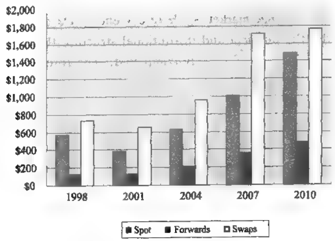

Figure 3.1 Global foreign exchange market turnover, 1998 - 2010 (daily averages in April, billions of U.S. dollars)

Source: Bank for International Settlements, "Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 2010"

foreign trade on goods and services in 2010 was about \$3.5 trillion[1]. The previous chapter shows the U.S. total volume of foreign trade was \$4.2 trillion in 2010. Those numbers will be meaningless if you compare them with the daily foreign exchange turnover in the foreign exchange market. Yet the number of people employed as foreign exchange traders in this industry is several thousand for the world as a whole.

The foreign exchange market is an informal, over-the-counter, around-the-clock market that includes the major commercial banks, and some specialized brokers in the principal financial centers throughout the world. They are connected by electronic communications systems such as Society for Worldwide Interbank Financial Telecommunications (SWIFT). Unlike stock or commodity exchanges, the foreign exchange market has no centralized meeting-place and no formal requirements for participation. Nor is the foreign exchange market limited to any one country. When companies wish to convert currencies, they typically go through their own banks rather than entering the market directly.

① China State Administration of Foreign Exchange, 2011

The foreign exchange market is a 24-hour market and never sleeps. Somewhere on the planet, financial centers are open for business, and banks and other institutions are trading the dollar, euro, pound and yen and other currencies, every hour of the day and night, aside from possible minor gaps on weekends. Tokyo, London, and New York are all shut for only 3 hours out of every 24. During these three hours, trading continues in a number of minor centers, particularly San Francisco and Sydney, Australia. These marketplaces overlap. **Figure 3. 2** shows the volume of currency transactions ebbs and flows across the globe as the major currency trading centers of London, New York, and Tokyo open and close throughout the day.

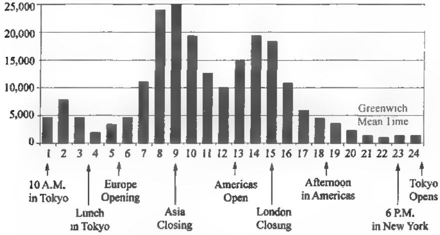

Figure 3. 2 Measuring foreign exchange market activity: average electronic conversions per hour

Source: Federal Reserve Bank of New York, "The Foreign Exchange Market in the United States", 2001, http://www.ny.frb.org

The U. S. dollar was involved in more than 84.9% of all foreign exchange transactions in 2010, followed by the euro (39.1%), Japanese yen (19%), British pound sterling (12.9%), Australian dollar (7.6%), Swiss franc (6.4%), Canadian dollar (5.3%), Hong Kong dollar (2.4%) and Swedish krona (2.2%). The most significant increases in emerging market currencies were seen for the Turkish lira, Chinese RMB and Korean won, followed by Brazilian real, and Singapore dollar. The RMB now accounts for almost 1% of global turnover, on a par with the Indian rupee and the Russian

ruble. ①

The widespread use of the U.S. dollar reflects its substantial international role as: "investment currency" in many capital markets, "reserve currency" held by many central banks, "transaction currency" in many international commodity markets, and "intervention currency" employed by monetary authorities in market operations to influence their own exchange rates. In addition to those functions, the U.S. dollar also serves as a "**vehicle currency**" which is a currency used to invoice international trade transactions. For most pairs of currencies, the market practice is to trade each of the two currencies against a third common currency as a vehicle, rather than to trade the two currencies directly against each other. For example, a Chinese company wants to invest in Indian capital market. The company will probably sell RMB for U.S. dollar and then sell dollar for Indian rupee. Although this approach results in two transactions rather than one, it may be the preferred way, since the RMB/dollar market and rupee/dollar market are much more active and liquid and have much better information than a bilateral market for the two currencies directly against each other. In this sense, the use of the vehicle currency may be cheaper for the Chinese company than it directly sells RMB for rupee.

The most important trading centers are London, New York and Tokyo. London dominates the foreign exchange market with average daily volume of 37% of the whole volume. The next is New York which accounts about 18% of activity, followed by Tokyo (6% of activity) and Singapore (5% of activity). Major secondary trading centers include Zurich, Frankfurt, Paris, Hong Kong, and Sydney②. Because foreign exchange dealers are in constant telephone and computer contact, the market is very competitive; in effect, it functions no differently than if it were a centralized market.

The structure of the foreign exchange market is shown in **Figure 3.3**. It also shows the different participants in this market. We now discuss the participants in the foreign exchange market in detail.

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① BIS "Triennial Central Bank Survey, report on global foreign exchange market activity in 2010" December 2010

② BIS "Triennial Central Bank Survey, report on global foreign exchange market activity in 2010" December 2010

■ Foreign exchange market structure

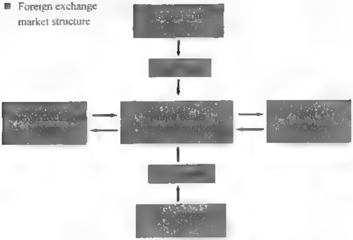

Figure 3.3 Foreign exchange market structure

Participants of the Foreign Exchange Market

Retail customers are made up of individuals, international investors, small businesses, speculators and the like who need foreign exchange for the purposes of operating their businesses or tourism. They are also called foreign exchange end-users. Normally, they do not directly purchase or sell foreign currencies themselves but operate by placing buy/sell orders with the local commercial banks. The foreign exchange needs of individuals are usually small and account for only a tiny fraction of all currency transactions. The retail customers are shown on the top and bottom of the Figure 3.3.

Commercial banks (market dealers) and other financial institutions carry out buy/sell orders from their retail clients and buy/sell currencies on their own account so as to alter the structure of their assets and liabilities in different currencies. The trading between banks occurs in what is often referred to as the interbank market (the middle part of Figure 3.3). The commercial banks usually serve as market dealers. There are around 2,000 dealer institutions that essentially make up the global foreign exchange market. A small number of market dealers are **market makers**, buying and selling one or more particular currencies at quoted exchange rates. Dealers making a market in foreign exchange stand ready to quote bid and offer (ask) prices on major currencies,

earning their profit by buying at their bid price and selling at a slightly higher offer price. In order to make a profit from this activity, the market maker must manage the firm's own inventory and position very carefully, and accurately perceive the short-term trends and the prospects of the market. In addition to the commercial banks, other financial institutions such as merchant banks are engaged in buying and selling currencies both for proprietary purposes and on behalf of their customers in finance-related transactions. Those banks are not market makers in the interbank market. Instead of maintaining significant inventory positions, they buy from and sell to larger banks to offset retail transactions with their own customers. The interbank market is the most important part of the whole foreign exchange market because it makes up more than 80% of all foreign exchange transactions.

Foreign exchange brokers are the intermediary who acts as agent for one or both parties in the transaction and, in principle, and do not commit capital. Foreign exchange brokers rely on the commission or fees received for the service provided. Brokers do not put their own money at risk and usually serve three important purposes in the foreign exchange market. First, a broker is a precious source of information for the traders in markets where one or two basis points can mean a difference of thousands of dollars on a contract. For example, if the market price of the British pound is $ 1.7035, a broker's offer may be $ 1.7034. For a 10 million pound deal, the broker's price can save a dealer $ 1,000. Second, he brings buyers and sellers together and contributes to market efficiency. Third, he makes it possible for traders to remain anonymous when revealing their identity would put them at a disadvantage. For example, if the U.K. central bank wants to dispose of an accumulated position in euros without signaling its activity to the market, it can use a broker to maintain anonymity. One disadvantage of dealing through a broker is that a small brokerage fee is payable which is not incurred in a straight bank to bank deal.

Businesses such as multinational corporations are the major nonbank participants in the foreign exchange market as they exchange cash flows associated with their multinational operations. Since the MNCs usually buy and sell a large quantity of foreign currencies, they will directly enter into the market.

Central banks are not indifferent to changes in the external value of their currency, they frequently intervene to buy and sell their currencies in a bid to influence the rate at which their currency is traded. As a matter of fact, all central banks participate in their nations' foreign exchange markets to some degree, and their operations can be of great importance to those markets. Therefore, the motive of the central banks is not to earn a profit as such, but rather to influence the foreign exchange value of their currency in a manner that will benefit the interests of their citizens. Foreign exchange market intervention is not the only reason central banks buy and sell foreign currencies. Many central banks are also their governments' bank. They buy and sell foreign currencies for their governments as well as public sector enterprises. A central bank also may seek to accumulate, allocate among currencies, or reduce its foreign exchange reserve balances.

Speculators and arbitragers seek to profit from trading in the market itself. They operate in their own interest, without a need or obligation to serve clients or to ensure a continuous market. Where dealers seek profit from the spread between bid and ask in addition to what they might gain from changes in exchange rates, speculators seek all of their profit from exchange rate changes. Arbitragers try to profit from simultaneous exchange rate differences in different markets. The difference between a speculator and an arbitrager is that the former takes the risks while the latter makes the riskless profits. Since investment to and from overseas has expanded far more rapidly than has trade. Institutional investors, insurance companies, pension funds, mutual funds, hedge funds, and other investment funds have become major participants in foreign exchange market. Some of them are speculators and arbitragers at some time.

Spot Exchange Market, Exchange Rate Quotations, and Foreign Exchange Arbitrage

Spot Exchange Market

Foreign exchange spot market is for spot transactions. Most transactions in our daily life are spot transactions. You go to a supermarket and pick up the goods you need, and then pay the store by cash or check or credit card. This is

a spot transaction because the deal is executed on the spot. In currency transactions, when two parties agree to exchange currency and execute the deal immediately, it is referred to as a spot transaction. Unlike the spot transaction in the supermarket, foreign exchange spot transactions do not require *immediate* settlement, or payment "on the spot". By convention, the settlement date, or "value date", is the second business day from the "deal date" (or "trade date") on which the transaction is agreed to by the two traders.

The exchange rate agreed to by the two parties in the spot transaction is called spot exchange rate. The **spot exchange rate** is the current market price, the rate at which a foreign exchange dealer converts one currency into another currency on a particular moment.

A spot transaction represents a direct exchange of one currency for another, and when executed, leads to transfers through the payment systems of the two countries whose currencies are involved.

For example: Bank A in Tokyo will agree on May 22 to sell \$10 million for Japanese yen to Bank B in New York at the rate of, say 81 yen per dollar, for value May 23. On May 23, Bank B will pay ¥810 million for credit to Bank A's account at a bank in the U.S., and Bank A will pay \$10 million for credit to Bank B's account at a bank in Japan. The execution of the two payments completes the transaction.

Direct and Indirect Quotes

Exchange rate quotes, as the price of one currency in terms of another, come in two forms: a **"direct" quotation** is the amounts of domestic currency per unit of foreign currency. An **"indirect" quotation** is the amounts of foreign currency per unit of domestic currency. Most countries adopt direct quotes while a few countries such as the United Kingdom and former colonies of Great Britain use indirect quotes. The euro is normally quoted indirectly; that is, the U.S. dollar price of a euro.

For example, a direct quote for the Canadian dollar would be US\$1.04 = C\$1 in U.S. Conversely, in Canada, a direct quote for the US dollar would be C\$0.96 = US\$1 which is the reciprocal of 1.04. Obviously, the direct quote from the U.S. perspective is an indirect quote from the Canadian viewpoint,

and the indirect quote from the U. S. perspective is a direct quote from the Canadian viewpoint.

Therefore, direct and indirect quotes are reciprocals, and either can easily be determined from the other.

European and American Quotes for the U. S. Dollar

Since the U. S. dollar is the most frequently traded currency in the foreign exchange market, it is common practice among currency dealers worldwide to both price and trade currencies against the U. S. dollar. Interbank quotations that include the U. S. dollar are conventionally given in **European terms**, which state the foreign currency price of one U. S. dollar, such as A$ 0.93 = US$ 1, DKr5.4 = US$ 1. This convention is used for all interbank dollar quotes except those involving the euro and British pound or the currencies of a few former colonies of the British Commonwealth. In those countries, exchange rates are expressed by the indirect quote.

A quote of the U. S. dollar price per foreign currency unit is called **American terms**. For example, in U.S. US$ 1.61 = £ 1, US$ 1.45 = € 1.

European and American quotes are not possible for transactions that do not include the U. S. dollar. In this book, we will use the following notation for exchange rate. In general, $S^{d,f}$ will refer to the price of one unit of currency f in terms of currency d. Thus, the American terms of US$ 1.04 = C$ 1 is $S^{US\$/C\$} = 1.04$. The corresponding European quote is $S^{C\$/US\$} = 0.96$.

Foreign exchange rates are quoted in all major world newspapers. **Exhibit 3.1** is derived from the Wall Street Journal of July 02, 2011 and displays part of the foreign exchange rates. The table gave the quotes of U. S. dollar verses other currencies in two ways. The U. S. dollar per currency (or US $ equivalent) is the price of other currencies in terms of the U. S. dollar. This is the American quotes (also direct quotes) from the U. S. viewpoints. The currency per U. S. dollar is the dollar price in terms of the other currencies. It is the European quotes. For example, 0.2436 of the first row under the "U. S. dollar per currency" column means that you must give $ 0.2346 in exchange for one Argentine peso on Friday. Equivalently, it takes 4.1057 Argentine pesos to purchase one U. S. dollar. This rate is shown under the "currency per U. S. dollar" column.

Exhibit 3.1 U.S.-dollar foreign-exchange rates in late New York trading (Friday, July 01, 2011)

Country(region)/currency	U.S. dollar per currency		Currency per U.S. dollar	
	Friday	Thursday	Friday	Thursday
Argentina peso	0.2436	0.2433	4 1057	4.1095
Brazil real	0.6353	0.6368	1.5742	1.5703
Canada dollar	1.0432	1.0380	0.9586	0.9634
Mexico peso	0.0861	0.0854	11.6088	11.7141
Australia dollar	1.0773	1.0722	0.9282	0.9327
China yuan	0.1547	0.1547	6.4642	6.4635
Hong Kong dollar	0.1285	0.1285	7.7816	7.7818
India rupee	0.02242	0.02233	44.60045	44.78495
Indonesia rupiah	0.0001165	0.0001162	8,581	8,605
Japan yen	0.01237241	0.01241234	80.83	80.57
Malaysia ringgit	0.3327	0.3318	3.0054	3.0138
New Zealand dollar	0.8274	0.8291	1.2086	1.2061
Singapore dollar	0.8155	0.8141	1.2263	1.2283
South Korea won	0.0009396	0.0009359	1,064.25	1,068.45
Taiwan dollar	0.03465	0.03459	28.857	28.910
Vietnam dong	0.00005	0.00005	20,531	20,585
Czech koruna	0.05986	0.05955	16.706	16.791
Denmark krone	0.1948	0.1944	5.1342	5.1430
Euro	1.4526	1.4502	0.6884	0.6896
Russia ruble	0.03591	0.03584	27.851	27.906
Sweden krona	0.1597	0.1580	6.2634	6.3281
Switzerland franc	1.1804	1.1898	0.8472	0.8405
Turkey lira	0.6162	0.6165	1.6228	1.6220
U.K. pound	1.6075	1.6052	0.6221	0.6230
Egypt pound	0.1678	0.1679	5.9578	5.9576
Kuwait dinar	3.6443	3.6367	0.2744	0.2750
Saudi Arabia riyal	0.2666	0.2667	3.7503	3.7500
South Africa rand	0.1486	0.1479	6.7297	6.7630

Source: *Wall Street Journal*, July 02, 2011

Bid and Ask Quotes

In the foreign exchange market there are always *two* prices for every currency the **bid quote** is the price at which a buyer of that currency wants to buy and the **ask quote** (also called **offer quote**) is the price at which a seller of that currency wants to sell. A market maker is expected to quote simultaneously for his customers *both* a price at which he is willing to sell and a price at which he is willing to buy standard amounts of any currency for which he is making a market. For example: For a U.S. resident, a direct quote for the Swiss franc might be

$1.0206/SFr Bid and $1.0217/SFr Ask

This means that the bank is willing to buy francs (and sell dollars) at $1.0206/SFr (less dollars to buy francs) or sell francs (and buy dollars) at $1.0217 (more dollars to sell francs). In other words, the bank is buying low and selling high. The difference between bid and ask prices for the bank in this example is $0.0011/SFr.

In countries using the indirect quotes, the bank's bid price is higher than the ask price. Remember, the indirect quotes state the price of a unit of domestic currency in foreign currency terms. In this case, an indirect Swiss franc quote to a U.S. resident might be:

SFr0.9798/$ Bid and SFr0.9787/$ Ask

The bank buys and sells foreign currency. For Americans the foreign currency is Swiss franc, not the dollar. The bank is willing to buy franc at the price of SFr0.9798/$ (the bank customer gives SFr0.9798 in exchange for one dollar) and sell franc at the price of SFr0.9787/$ (the bank customer takes one dollar to purchase SFr0.9787).

The rule for determining the currency that is being quoted is as follows:

- When the bid quote is lower than the ask quote, the bank is buying and selling the currency in the denominator of the quote. In the above first quote, 1.0206 is lower than 1.0217, the bank is buying and selling the Swiss franc (denominator currency).
- When the bid quote is higher than the ask quote, the bank is buying and selling the currency in the numerator of the quote. In the above second quote, 0.9798 is higher than 0.9787, the bank is buying and selling the Swiss franc (numerator currency).

Bid-ask Spread and Bid-ask Margin

The bank's **bid-ask spread** is the differential between bid and ask prices. It reflects the bank's gain of buying and selling foreign exchanges. Like the example above, \$1.0206/SFr Bid and \$1.0217/SFr Ask, bid-ask spread is \$0.0011/SFr. Economists like to use point to describe the difference between the bid and ask price. Usually the last digit of a quotation is referred to as a point. Hence, a **point** is equal to 1% of 1% or 0.0001 for most currencies. In our example, the spread here is 11 points. The bid-ask spread can also be expressed as a percent of the ask price, known as the **bid-ask margin**, which is:

$$\text{Bid-ask margin} = (\text{ask price} - \text{bid price})/\text{ask price} \times 100 \qquad (3.1)$$

In this example, the bid-ask margin is calculated by applying equation (3.1):

$$(1.0217 - 1.0206)/1.0217 \times 100 = 0.1077\%$$

For most currencies, bid and offer quotes are presented to the fourth decimal place — that is, to one-hundredth of one percent, or $1/10{,}000^{\text{th}}$ of the terms currency unit. However, for a few currency units that are relatively small in absolute value, such as the Japanese yen, quotes may be carried to two decimal places, 1/100 of the terms currency unit. So 1 point for Japanese yen refers to 1% or 0.01.

Cross Rates

For currencies that are traded frequently like the US dollar, euro and the Japanese yen, the system is fairly straightforward. But how do we know the rate of the Vietnamese dong for the Polish zloty? The IMF records exchange rates for 152 countries, which means that there are $(152 \times 151) / 2 = 11{,}476$ different pairs of possible exchange rates. Most of these possibilities are likely never to come up for a trade and many only once in a blue moon. If they do come up, however, how can the trader arrive at a price?

The answer is that all currencies are quoted against the US dollar. Knowing the price of any two currencies against the dollar means that the price of one currency for the other can easily be found. The exchange rate between two currencies not involving the dollar is called the cross rate. So a **cross rate** is a rate calculated from two known bilateral exchange rates. Here again we see the

importance of the vehicle currency the U. S. dollar. For 152 member countries, there would be a total of 151 exchange rates to be dealt with (i. e., one exchange rate for the U. S. dollar against each of the others). Use of the dollar as a vehicle currency greatly reduces the number of exchange rates that must be dealt with in a multilateral system.

Now let's take some examples to see how cross rates are calculated.

(1) If the $S^{SFr/\$}$ is 0.9855—65, and the $S^{¥/\$}$ is 85.01—08, what is the $S^{¥/SFr}$ bid and ask cross rate?

Suppose you are a bank's customer and have one Swiss franc, how much Japanese yen can you buy?

First, you have to buy U. S. dollar with the Swiss franc using the bank's dollar ask price of 0.9865 SFr/\$. Then you sell \$1.0137 (1/0.9865) for Japanese yen at the bank's dollar bid price of 85.01. Finally, you get ¥86.17 (1.0137×85.01). This is the bank's swiss franc bid price.

By the same token, you can calculate the bank's swiss franc ask price which is 86.33/SFr. The formula for cross-rate calculation is as follows:

$$S_b^{x/x} = S_b^{z/y} / S_a^{x/y} \quad (3.2)$$

$$S_a^{x/x} = S_a^{z/y} / S_b^{x/y} \quad (3.3)$$

Where

$S_b^{z/x}$: the bid rate of currency x versus currency z

$S_a^{z,x}$: the ask rate of currency x versus currency z

Applying equation (3.2) and equation (3.3), we get Swiss franc bid price:

Bid of ¥/ SFr: 85.01/0.9865 = 86.17

The Swiss franc ask price is:

Ask of ¥/ SFr: 85.08/0.9855 = 86.33

(2) If the $S^{\$/£}$ is 1.6000—10 and the $S^{¥/\$}$ is 85.01—08, what is the $S^{¥/£}$ cross rate? We need follow the same logic as in the above question. You take one pound to buy \$1.6000, and then sell the dollar for yen which is ¥136.02 (1.6000 × 85.01). So,

Bid of ¥/£ = 1.6000×85.01 = 136.02

Ask of ¥/£ = 1.6010×85.08 — 136.21

Cross rates often appear in the form of a matrix in newspapers, as shown in

Exhibit 3.2. The currency column refers to one unit of that currency and the country row represents the units of currency of that country. Here, to find the value of the British pound relative to the Swiss franc, we simply locate the intersection of the pound column and the Switzerland row. The cross rate is given as 1.3640 which means one pound can exchange for 1.3640 Swiss franc. In like manner, the cross exchange rates of other key currencies can be read directly from the table.

Exhibit 3.2 Key currency cross rates
(Tuesday, July 5, 2011)

	Dollar	Euro	Pound	Sfranc	Peso	Yen	Cdndlr
Canada	0.9611	1.3973	1.5457	1.1332	0.0829	0.0119	-
Japan	80.7900	117.4565	129.9268	95.2572	6.9725	—	84.0586
Mexico	11.5869	16.8457	18.6342	13.6618	—	0.1434	12.0557
Switzerland	0.8481	1.2330	1.3640	—	0.0732	0.0105	0.8824
U.K.	0.6218	0.9040	---	0.7332	0.0537	0.0077	0.6470
Euro	0.6878	—	1.1062	0.8110	0.0594	0.0085	0.7157
U.S.	—	1.4539	1.6082	1.1791	0.0863	0.0124	1.0405

Source: *The Wall Street Journal*, July 6, 2011

Percentage Changes in Exchange Rates

The exchange rates change all the time especially in the spot exchange market. When an exchange rate changes, one currency either gains or loses value relative to another currency. If a currency gains value relative to another currency in the exchange market, the currency appreciates. If a currency loses value relative to another currency, it depreciates. Therefore, **appreciation** of a currency refers to the rise in the price of the currency and **depreciation** of a currency means the price of the currency falls in the foreign exchange market. The appreciation or depreciation of a currency is usually measured in percentage terms.

For example, if the U.S. dollar-Japanese yen exchange rate changes from \$0.0095/¥ to \$0.0092/¥ during a three-month span, it means that fewer US dollars have to be taken to get one Japanese yen, so the dollar appreciates

against yen, or the yen depreciates against the dollar. But what is the percent decrease in the dollar value of the Japanese yen and what is the percent increase in the yen value of the U.S. dollar? Percentage changes in currency values are asymmetric, which means the percent decrease in yen not equal to the percent increase in dollar. For example, if the number of the students majoring in finance increases from 1,000 to 1,500, it is a 50% increase in the number of the students whose main subject is finance. If the number of students falls from 1,500 to 1,000, it is an approximately 33% decrease in the number of the students majoring in finance.

When we talk about appreciation or depreciation of a particular currency, we usually put the currency in the place of the denominator in the exchange rate. In the above example, we were talking about the value of the Japanese yen. Since a unit of Japanese yen now can buy fewer dollars than before, the yen depreciates against the dollar. We can use the following formula to calculate the percent decrease in the dollar value of a Japanese yen:

Percentage change in the value of the currency in denominator
= (Ending rate−Beginning rate) / (Beginning rate) (3.4)

($0.0092/¥ − $0.0095/¥) / $0.0095/¥ = −0.0316 = −3.16%

The yen depreciates against the dollar by about 3.16%. For annual percentage change, it is 3.16%×4 = 12.64%.

If we want to know the changes in value of the dollar, we can use the reciprocal of the above exchange rates, that is, the value of the dollar changes from ¥105.26/$ [1/($0.0095/¥)] to ¥108.70/$ [1/($0.0092/¥)]. Thus, we put the dollar in the place of the denominator in the exchange rate. We then apply the equation (3.4) and get the appreciation rate of the dollar which is 3.268% or 13.07% p.a.

(¥108.70/$ − ¥105.26/$) / ¥105.26/$ − 3.268%

This problem can also be solved by applying the following formula:

Percentage change in the value of the currency in numerator
– (Beginning rate Ending rate) / (Ending rate) (3.5)

In our example, the beginning rate is $0.0095/¥ and the ending rate is $0.0092/¥, the change in value of the U.S. dollar is then:

$$(0.0095-0.0092)\ /\ 0.0092 = 3.26\%$$

The dollar appreciates against the yen by 3.26%. The annual percentage change rate is $3.26\% \times 4 = 13.04\%$.

Foreign Exchange Arbitrage

Although the popular press often uses the term arbitrage to refer to speculative position, arbitrage is more strictly defined as a profitable position obtained with no net investment and no risk. This type of "no money down and no risk" opportunity sounds too good to be true. In the high-stakes international currency markets, it usually is too good to be true once trading costs are included. Arbitrage opportunities are exploited just as quickly as they disappear, as market forces drive prices back toward equilibrium.

Foreign exchange arbitrage means buying one currency in one place and selling it in another place at the same time to make riskless profit. If the process is taking place in two places, it is a **spatial arbitrage**. When the process is taking place in three places, it is called **triangular arbitrage**.

The following example illustrates the spatial arbitrage:

If in New York, U.S. dollar per Danish krone rate is $S^{\$/DKr} = 0.1584-94$, and in London, the dollar price in terms of the krone is $S^{DKr/\$} = 6.3520-60$, and assume a trader has \$1 million line of credit and both markets are open without restrictions against buying and selling currencies. The trader finds the Danish krone is cheaper in London because the reciprocals of 6.3520 − 60 is 0.1574−0.1573. The trader can buy Danish krone in London and sell it in New York, the no money down and no risk arbitrage profit will be:

\$1 million×6.3520 = DKr 6,352,000 (sell dollar for krone in London)

6,352,000×0.1584 = \$1,006,157 (sell krone for dollar in New York)

\$1,006,157 − \$1,000,000 = \$6,157

if there are not any other fees.

Like the example shows, such arbitrage is practical only if the participants have instant access to quotes and executions. The trader must know the krone/dollar rates are quoted differently in two different markets. When he knows the difference, he should be able to execute the buying and selling orders. It means there is no any kind of restrictions on the foreign exchange transactions in both

markets. Also the trader can conduct such arbitrage without an initial sum of money, other than his bank's credit standing, because the trades are offset by electronic means before the normal settlement two days later.

The *triangular arbitrage* is a little more complex and involves three or more currencies and/or markets.

Suppose you are given exchange rates for currencies d, e, and f. The **no-arbitrage condition for triangular arbitrage** in the currency markets is

$$S^{d/e} S^{e/f} S^{f/d} = 1 \tag{3.6}$$

If this condition does not hold within the limits of transactions costs, then there is an opportunity for a riskless profit through triangular arbitrage.

For example: Suppose the following exchange rates hold among U. S. dollars, pounds, and euros:

$$S^{\$} = \$\ 1.3524/€$$
$$S^{\$/£} = \$\,1.6010/£ \longrightarrow £\,0.6246/\$$$
$$S^{€/£} = €\,1.1766/£$$

The product of the spot rates is less than 1:

$$\begin{aligned} S^{\$/€} S^{€/£} S^{£/\$} &= (\$\,1.3524/€)\ (1.1766/£)\ (£\,0.6246/\$) \\ &= 0.9939 < 1 \end{aligned}$$

Thus, these rates are not in equilibrium and there is an arbitrage opportunity so long as transactions costs are not too high.

Suppose you start with € 1 million and simultaneously make the following transactions in a *round turn* (that is, buying and then selling each currency in turn):

Sell € for £ (€ 1,000,000) / (€ 1.1766/£) = £ 849,906.51

Sell £ for \$ (£ 849,906.51)×(\$ 1.6010/£) = \$ 1,360,700.32

Sell \$ for €(\$ 1,360,700.32) / (\$ 1.3524/€) = € 1,006,137.47

The profit will be € 1,006,137.47−€ 1,000,000=€ 6,137.47 (ignoring the transaction costs), and the rate of return is approximately 0.6%.

This is the only way that you can make money. If you go the wrong way on your round turn, you will lose your money. How can you tell which direction to go on your round turn?

Here is a rule for determining which currencies to buy and sell in triangular

arbitrage:

If $S^{d/e}S^{e/f}S^{f/d} < 1$, then $S^{d/e}$, $S^{e/f}$, or $S^{f/d}$ must rise,

→ Buy the currencies in the denominators with the currencies in the numerators.

If $S^{d/e}S^{e/f}S^{f/d} > 1$, then $S^{d/e}$, $S^{e/f}$, or $S^{f/d}$ must fall,

→ Sell the currencies in the denominators for the currencies in the numerators.

If the given exchange rates are not in the format of $S^{d/e}$ $S^{e/f}$ $S^{f/d}$, they should be altered to be consistent with the standard format. Like the example above, the dollar/pound exchange rate was given $S^{\$/£} = 1.6010$, and we changed the exchange rate to be $S^{£/\$} = 0.6246$. Therefore, because the given three exchange rates are in the form of $S^{\$/€}$, $S^{€/£}$, and $S^{£/\$}$, we can tell whether there are discrepancies among the given exchange rates.

The Forward Foreign Exchange Market

Forward Market and Forward Exchange Rate

Forward foreign exchange market is for forward foreign exchange transactions. It means the rates and the amounts of the deal are agreed on today but settlement occurs sometime later than two days in the future. For example, a Japanese trader who has to pay \$5,000,000 to the U.S. supplier at the end of June may decide on April 1 to buy \$5,000,000 for delivery on June 30 at a forward exchange rate of ¥85/\$1. Forward contracts are usually big contracts. In some cases, the minimum is \$1 million or equivalent and sometimes it must be \$5 million at least. The two parties involved in a forward contract can negotiate for just about any maturity but most banks supply regular quotes on maturities of 30, 60, 90, and 180 days. In some cases, it is possible to get forward exchange rates for a few days to several years into the future. Very long-dates forward contracts are rare because they tend to have a large bid-ask spread and are relatively expensive.

The **forward exchange rate** can be defined as the rate to be paid for delivery of specific currency at some future date.

Regular quotes on forward contracts are limited to a relatively small number of currencies. The U.S. dollar, euro, the Japanese yen and the British

pound make up a large part of the whole market. A common use of forward contracts is to eliminate uncertainty in commercial contracts arising from possible changes in the exchange rate. The same reasoning can be applied to investors who make forward contracts to lock in returns in domestic currency.

Forward Discounts and Premiums

Exhibit 3.3 illustrates the spot and forward quotations for euro and U.S. dollar. Usually, the forward exchange rate is different from the spot exchange rate because of the differences in interest rates of the currencies. The quotation of forward rates can be given either outright or basis points. This table gave the outright forward quotes of euro and dollar.

Exhibit 3.3 Spot and forward quotes for euro and the U.S. dollar
(July 6, 2011)

Euro: Spot and forward (\$ /€)			Dollar: Spot and forward (¥ / \$)		
Term	Bid	Ask		Bid	Ask
Spot	1.4462	1.4466		81.03	81.07
1-month	1.4449	1.4451		81.06	81.08
3-month	1.4424	1.4426		81.01	81.02
1-year	1.4287	1.4493		80.71	80.73

Source: *The Financial Times*, July 05, 2011

The forward quotes can also be expressed as the basis points. For example, 3-month forward euro could be given as follows:

	Bid	Ask
Spot:	\$1.4462/€	\$1.4466/€
Forward: (90 days) basis points	38	−40

The 1-month forward dollar can be quoted as the basis points as follows:

	Bid	Ask
Spot:	¥81.03/\$	¥81.07/\$
Forward: (30 days) basis points	3	1

As we discussed before, most currencies are usually quoted to four decimal points, so one basis point is the last digit of the quote. However, the price of Japanese yen is quoted only to two decimal points; one point is 0.01 for Japanese yen. In our example, 3 and 1 point mean 0.03 and 0.01 respectively. It should be noted that the 3 points and 1 point is not a foreign exchange rate as such. Instead, it is the difference between the forward rate and the spot rate.

The value of the euro in terms of dollar in the forward market is lower than in the spot market. The euro is trading at a forward discount. A currency is trading at a **forward discount** when the value of that currency in the forward market is lower than in the spot market. On the other hand, the dollar is trading at a **forward premium** because the dollar's forward value against both the euro and yen is higher than its spot value. Chapter 5 will discuss why the value of a currency is different in spot market than in forward market.

In some cases, forward premiums/discounts are also quoted as an annualized percentage deviation from the current spot rate. This is the forward quotes in percentage terms. The formula for forward premium/discount of the foreign currency in percentage term is

$$\text{Forward Premium/Discount of the currency} \quad (f) = (n)\left[(F_t^{d/f} - S_0^{d/f})\right] / (S_0^{d/f}) \tag{3.7}$$

where

$S_0^{d/f}$: the spot exchange rate at time 0

$F_t^{d/f}$: the forward exchange rate matured at time t

n: the number of compounding periods per year

Multiplying by n translates the periodic forward premium into an annualized rate with n-period compounding. For example, a 6-month forward premium is annualized by multiplying the 6-month forward premium by $n=2$. Similarly, a 1-month forward premium is multiplied by $n=12$.

The forward premium/discount of the domestic currency in percentage term can be calculated as:

$$\text{Forward Premium/Discount of the currency} \quad (d) = (n)\left[(S_0^{d/f} - F_t^{d/f})\right] / (F_t^{d/f}) \tag{3.8}$$

For example, $S^{\$/€} = 1.4464$, 3-month forward euro $F^{\$/€} = 1.4425$, the

annualized forward discount for the euro is calculated by applying equation (3.7):

Here, n is 4 (12/3).

$$(n)\,[(F_t^{d/f}-S_0^{d/f})]\,/\,(S_0^{d/f}) -(4)\,(\$1.4425/€\quad \$1.4464/€)\,/\,(\$1.4464/€)$$
$$= (4)\,(-0.002696) = -0.010785 \text{ or } 1.0785\%$$

discount rate annually

The annualized forward premium for the U.S. dollar in this example can be calculated by applying equation (3.8):

$$(n)\,[(S_0^{d,f}-F_t^{d/f})]\,/\,(F_t^{d,f}) = (4)\,(1.4464-1.4425)\,/\,(1.4425)$$
$$= 1.0815\%$$

Foreign Exchange Risk and Hedging Strategies

Forward contracts are used to reduce the foreign exchange risk inherent in foreign currency payment or receipt. **Foreign exchange risk** refers to fluctuations in the domestic value of assets, liabilities, income or expenditure due to unanticipated changes in exchange rates. A firm with international operations finds its business activity and financial settlement affected by changes in foreign exchange rates of currencies in which it is dealing. Such firms must measure foreign exchange exposure and manage it so as to maximize the profits of the firm.

A great number of real world cases show that changes in exchange rates have a huge impact on a firm's profits or earnings. For example, Volkswagen, Europe's largest carmaker in January 2004 reported a 95% drop in 2003 fourth-quarter profits, which slumped from €1.05 billion to mere €50 million. For all of 2003, Volkswagen's operating profit fell by 50% from the record levels attained in 2002. There were many causes to explain the company's profit slump, but two of the factors were considered the most important ones. The first was the unprecedented rise in the value of the euro against the dollar during 2003. In 2002, the exchange rate between the U.S. dollar and euro was \$1 = €1. In late 2003, the euro increased its value by 25% from \$1 – €1 to \$1.25 = €1. This means that the Volkswagen would suffer 20% loss when they converted their U.S. dollar profits to the euro. The second cause was the company's decision to

hedge only 30% of its foreign currency exposure, as opposed to the 70% it had traditionally hedged. In total, currency losses due to the euro's rise are estimated to have reduced Volkswagen's operating profits by some € 1.2 billion.

Categories of Foreign Exchange Risk

Foreign exchange risk is usually divided into three main categories: transaction exposure, translation exposure, and economic exposure. **Foreign exchange exposure** is what *is* at risk. Foreign exchange exposure does not always result in losses. They may occasionally result in gains to firms because in some cases the exchange rates change favorably to the firms.

Transaction exposure is the extent to which the income from individual transactions is affected by fluctuations in foreign exchange values. Transaction exposure arises from the purchase or sale of goods and services when prices are stated in foreign currencies and the borrowing or lending of funds in foreign currencies. For example, suppose in 2011 an American importing company agreed to purchase 1,000 Haier refrigerators for \$500 each for a total price of \$500,000, with delivery scheduled for 2012 and payment due then. When the contract was signed in 2011 the RMB/dollar exchange rate stood at \$1 = ¥6.55 so Haier company anticipated receiving ¥3.275 million (\$500,000 × 6.55) for the 1,000 refrigerators when they were delivered. However, imagine that the value of the dollar depreciated against the RMB over the intervening period, so that one dollar only buys ¥6.40 in 2012 when payment is due. Now the total receipts in RMB are ¥3.2 million (\$500,000 × 6.4 = ¥3.2 million), in decrease of ¥75,000! The transaction exposure here is ¥75,000, which is the money lost due to an adverse movement in exchange rates between the time when the deal was signed and when the refrigerators were paid for.

Translation exposure is the potential change in the reported financial statements of a company due to changes in exchange rates (also called accounting exposure). Translation exposure arises as the parent firm translates the financial statements of its foreign subsidiaries back into its domestic currency using the generally accepted accounting principles of the parent country. Foreign subsidiaries of U.S. companies, for example, must restate local euro, pound, yen, and so on, financial statements into U.S. dollars so the foreign values can be added to the parent's U.S. dollar-denominated balance

sheet and income statement. The resulting accounting gains or losses are said to be unrealized — they are "paper" gains and losses — but they are still important. Consider a European firm with a subsidiary in U.S. If the value of the dollar depreciated significantly against the euro this would substantially reduce the euro value of the U.S. subsidiary's equity. In turn, this would reduce the total euro value of the firm's equity reported in its consolidated balance sheet. This would raise the apparent leverage of the firm (its debt ratio), which could increase the firm's cost of borrowing and potentially limit its access to the capital market. This is exactly the case in 2002–2004. The dollar fell rapidly in value against the euro and many European firms suffered from significant translation exposure. Usually, performance evaluations and management compensation are often tied to accounting performance, so managers have a strong incentive to minimize their accounting exposure.

Economic exposure refers to potential changes in all (monetary or nonmonetary) future cash flows due to unexpected changes in exchange rates. It is concerned with long-term effect of changes in exchange rates on future prices, sales, and costs. Therefore, economic exposure measures the amount of potential gain or loss in the value of the firm due to the exchange rate fluctuations. This is distinct from transaction exposure, which is concerned with effect of exchange rate changes on individual transactions, most of which are short-term affairs that will be executed within a few weeks or months. Consider the effect of wide swings in the value of the dollar on many U. S. firms' international competitiveness. The rapid rise in the value of the dollar on the foreign exchange market in the 1990s hurt the price competitiveness of many U.S. producers in world markets. U.S. manufacturers that relied heavily on exports saw their export volume and world market share decline. The reverse phenomenon occurred in 2000 – 2004, when the dollar declined against most major currencies. The fall in the value of the dollar helped increase the price competitiveness of U.S. manufacturers in world markets.

Hedging with Forward Contracts

Foreign exchange risk makes successful planning difficult. An individual or firm always tries to avoid or eliminate the foreign exchange risk. One of the strategies the financial managers usually take is the hedging. **Hedging** is the act

of offsetting exposure to risk. The exposure to be hedged can arise from a commercial transaction, a foreign investment or a liability in foreign currency. The exposure can also be a long position or a short position. A position is said to be long when foreign currency or a claim in foreign currency is owned. In other words, a long position in foreign exchange refers to the amounts of foreign exchange that are owned. A position is short when there is a liability in foreign currency. That is to say, a short position in foreign exchange means the amounts of foreign currency that are owed. For example, an export billed in foreign currency creates a long position for the exporting firm in the form of a claim in foreign currency for value of the merchandise. On the other hand, an import billed in foreign currency creates a short position for the importing company in the form of a liability for the amount of the purchase. Now let's discuss how to hedge a long position or a short position.

Hedging a long position

Consider a Chinese textile company that has just signed a contract for \$1 million worth of jeans to be shipped to the U.S. and paid for in three months time. The spot exchange rate in Shanghai when the contract is signed is:

$$S^{¥/\$} = 6.8550$$

The chief financial officer of the company fears a fall in the value of the dollar, which would reduce the company's income when the jeans are finally delivered and the dollar proceeds are converted into RMB. In order to cover this risk his banker suggests that he sell \$1 million three months forward. The forward rate happens to be:

$$F^{¥/\$} = 6.8500$$

This means that no matter what the spot exchange rate is in three months time the company will deliver \$1 million to the bank and the bank will credit the company's account for ¥6.85 million. By selling its dollars forward, the company can guarantee what its income will be in RMB.

Figure 3.4 illustrates the change in the company's risk exposure resulting from the forward transaction. The solid line represents the company's income in RMB before making the forward transaction. It depends on the level of the exchange rate. At higher values of the dollar, RMB income is higher. At lower dollar values it is lower. The broken line represents the company's income after the forward

transaction. Income in RMB is insensitive to the level of the exchange rate. No matter what the value of the dollar is, RMB income is the same. The forward transaction has effectively eliminated the foreign exchange risk.

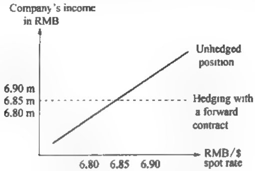

Figure 3.4 Hedging a long position

Eliminating foreign exchange risk has disadvantages as well as advantages. The main advantage is that if the value of the dollar falls, the company has no loss of income, which is guaranteed at ¥6.85 million. The disadvantage is that if the value of the dollar goes up, the company will not benefit from the appreciation. Furthermore, hedging the foreign exchange risk exposes the company to another kind of risk. Suppose that the exporter is not paid on time or that some of his merchandise is refused. The exporter will not have enough dollars to honor his forward contract. In order to make up the difference he will either have to roll over the forward contract at a new rate or buy dollars at the going spot rate. Either rate might be different from the 6.85 exchange rate of the forward contract. If the rollover rate is lower or the spot ask rate is higher, the company will make an unanticipated loss. Hedging in the forward market is a two-edged sword.

As a general rule of thumb, then, we can say that if the treasurer feels that there is a strong chance that the value of the dollar will fall and a weak chance that it will rise, the treasurer should hedge with a forward contract. In the opposite case where there is a strong chance that the dollar will appreciate and a weak chance that it will depreciate, he should not hedge.

Hedging a short position

Hedging a short position involves buying foreign exchange forward.

Consider a Chinese electronic appliance company that has just signed a contract to buy \$1 million of PC in three months time from its Texas supplier in U.S. The current spot exchange rate in Shanghai is:

$$S^{¥/\$} = 6.8550$$

The treasurer of the Chinese company fears that the dollar will appreciate and thus the cost of the merchandise in RMB will rise when the time comes to pay for them. In order to avoid this undesirable eventuality, the treasurer goes to the company's banker and buys \$1 million three months forward. The forward rate is again:

$$F^{¥/\$} = 6.8500$$

In three months the Chinese company will deliver ¥6.85 million and receive \$1 million, no matter what the exchange rate is. **Figure 3.5** illustrates the change in the company's risk exposure resulting from the forward transaction. The solid line represents the company's expenditure in RMB before the forward transaction. It depends on the level of the exchange rate. At higher values of the dollar, RMB expenditure is higher. At lower dollar values it is lower. The broken line represents the company's expenditure after the forward transaction. Expenditure in RMB is insensitive to the level of the exchange rate. No matter what the value of the dollar is, RMB expenditure is the same. The forward transaction has effectively eliminated the foreign exchange risk.

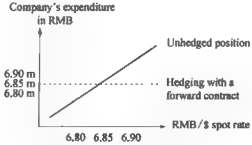

Figure 3.5 Hedging a short position

Here again, eliminating foreign exchange risk has disadvantages as well as advantages. The key advantage is that if the value of the dollar rises, the company has no increase in expenditure, which is guaranteed at ¥6.85 million.

The disadvantage is that if the value of the dollar goes down, the company will not benefit from the depreciation. Furthermore, as we saw in the preceding example, hedging the foreign exchange risk exposes the company to another kind of risk. Suppose that delivery dates from the Texas supplier are not respected or that some of the merchandise is not up to standards and must be refused. Expenditure for the merchandise will be lower than expected, which will leave the company with dollar balances once the forward contract is consummated. When the dollar balances are converted back into RMB, the spot exchange rate might be higher or lower than the 6.85 exchange rate of the forward contract. If it is higher, the company will make an unanticipated gain. If it is lower it will make an unanticipated loss. This kind of risk would not be present in the absence of the forward contract.

Other Types of Exchange Rates

Nominal and Real Exchange Rate

Policy-makers and economists are very much concerned about analyzing the implications of exchange rate changes for an economy and balance of payments. The exchange rate itself does not convey much information, and to analyze the effects and implications of exchange rate changes economists compile indices of the nominal, real and effective exchange rates.

The nominal exchange rate is the exchange rate that prevails at a given date. The exchange rates published in a newspaper or magazine or some websites are all nominal exchange rates. The nominal exchange rate does not merely reflect changes in price levels in the relative countries. It is mainly determined by the demand and supply of the relative currencies in the foreign exchange market. The nominal exchange rate just tells you how many units of another currency that one currency is actually able to exchange for.

The real exchange rate is the nominal exchange rate adjusted for relative changes in domestic and foreign price levels. That is, adjusted for inflation differential. Therefore, the real exchange rate reflects the purchasing power of a currency in terms of the goods and services the currency can actually buy in another country.

Suppose right now the RMB — U.S. dollar spot exchange rate is $S_0^{¥/\$}$ —

¥6.5/$. Expected inflation is $E[p^{¥}] = 10\%$ in China and $E[p^{\$}] = 3\%$ in the United States. If change in the nominal exchange rate fully reflects changes in the relative purchasing power of the RMB and the dollar, the expected future spot rate in one period would be:

$$E[S_1^{¥/\$}] = S_0^{¥/\$}[(1+E[p^{¥}]) / (1+E[p^{\$}])]$$
$$= (¥6.5/\$)(1.1/1.03) = ¥6.94/\$$$

If in one period, the expected inflation rate is the same as the actual inflation rate and the exchange rate is $S_1^{¥/\$} = 6.94$, the nominal exchange rate is the real exchange rate because the changes in exchange rate match the changes in price level of the two countries. What if one year later the inflation estimates turn out to be accurate but the dollar has appreciated to $S_1^{¥/\$} = 6.7$? Apparently, $S_1^{¥/\$} = 6.7$ is not the real exchange rate because it does not match the changes in inflation rates. In nominal terms, dollar appreciates against RMB by 3.08% [(6.7−6.5) / (6.5)]. But, relative to the expected spot rate of ¥6.94/$, the dollar is undervalued. The undervalued currency is a currency whose value is lower than it is supposed to be. We'll discuss it in Chapter 5 in detail. The rate of undervaluation of the dollar is calculated by the following formula:

$$[(\text{Actual exchange rate}) - (\text{Expected exchange rate})] / (\text{Expected exchange rate}) \tag{3.9}$$

$$= (¥6.7/\$ - ¥6.94/\$) / (¥6.94/\$) = -3.46\%$$

The real exchange rate captures changes in the purchasing power of a currency relative to other currencies by backing out the effects of inflation from changes in nominal exchange rates. Economists use the following formula to calculate the real exchange rate:

$$S_R^{d/f} = S_N^{d/f} / [(p^d) / (p^f)] \quad \text{or } S_N^{d/f} \cdot [(p^f) / (p^d)] \tag{3.10}$$

where

$S_R^{d/f}$: real exchange rate

$S_N^{d/f}$: nominal exchange rate

P^d: domestic price index

P^f: foreign price index

We can calculate the real exchange rate if one year later the dollar has

appreciated to $S_1^{¥/\$} = 6.7$ and the inflation index in China and U.S. is 110 and 103 respectively.

Applying equation (3.10), we get:

$$S_R^{¥/\$} = S_N^{¥/\$} \times (p^{\$}) / (p^{¥})$$

$$S_R^{¥/\$} = 6.7 \times (103) / (110) = 6.7 \times 0.9364 = ¥6.2739/\$$$

The real exchange rate indicates that the U.S. goods are more competitive on international markets than would be suggested by the nominal exchange rate. In real terms, the dollar depreciates against the RMB, that is, one unit of American goods or services can be changed into fewer Chinese goods or services now. The real exchange rates provide a better gauge of international competitiveness than nominal exchange rates. According to the economic theory, a rise in the dollar real exchange rate is likely to reduce the competitiveness of U.S. firms in the world market and vice versa.

Effective Exchange Rate

Since most countries of the world do not conduct all their trade with a single foreign country, policy makers are not so much concerned with what is happening to their exchange rate against a single foreign currency but rather what is happening to it against a basket of foreign currencies with which the country trades. **The effective exchange rate** is a measure of whether or not the currency is appreciating or depreciating against a weighted basket of foreign currencies. The effective exchange rate is sometimes also called "traded weighted" exchange rate, because it is computed by formulating a weighted average (reflecting the importance of each country's currency in international trade) of selected bilateral rates. **Exhibit 3.4** shows the nominal effective exchange rate indices from 1990 to 2010 for selected major developed countries. The nominal effective index simply calculates how the currency value relates to some given base period, but it is used in the formation of the real effective exchange rate index.

According to the definition of the effective exchange rate, it is a measure of a currency's strength and weakness against a basket of currencies. To construct an effective exchange rate, we need first choose a basket of currencies. For example, to construct the U.S. dollar effective exchange rate, we have to decide what currencies will be included in the basket. There are

several criteria for choosing currency basket. Economists usually choose the currencies that they judge to be most important. Second, we should select a base period which serves as a reference point in time. For example, the table uses 1990 as the base period. The dollar value was 100 in base period. In 1995, the dollar value was 91.79 meaning the value of the dollar reduced by 8.21% compared to its value in 1990. In other words, the dollar was cheaper than before. Third, we should assign weights for each currency in the basket. The weights are a means of placing greater emphasis on the more important currencies in the currency basket and less emphasis on the least important currencies in the currency basket. Typically, economists determine the weights on bilateral trade flows.

Exhibit 3.4 Nominal effective exchange rate indices for major developed countries 1990 - 2010 (annual averages) 1990 average = 100

	Australia	U.K.*	Canada	Euro	Japan	U.S.
1990	100	96.34	100	100	100	100
1991	98.48	96.97	101.71	97.33	108.41	98.49
1992	90.92	93.82	95.75	100.71	113.67	96.51
1993	84.19	85.52	90.27	96.95	136.57	99.47
1994	87.21	85.88	84.66	95.32	147.06	97.59
1995	83.24	82.25	83.01	99.55	154.34	91.79
1996	92.22	83.62	84.44	99.64	134.02	96.59
1997	93.08	96.18	84.62	90.79	126.18	104.44
1998	82.5	99.73	79.53	90.82	118.21	109.5
1999	82.08	99.10	79.04	86.65	138.22	106.81
2000	76.41	100.00	79.96	78.49	153.64	111.21
2001	72.05	99.21	77.62	78.66	138.81	118.45
2002	74.52	100.37	76.16	80.65	131.67	117.15
2003	81.43	96.83	83.66	88.97	131.94	103.56
2004	86.1	101.60	88.58	91.25	135.09	95.3

Continued

	Australia	U.K.*	Canada	Euro	Japan	U.S.
2005	89.21	100.38	95.17	91.62	132.41	94.17
2006	89.85	101.24	101.82	92.74	124.64	97.78
2007	96.59	103.70	107.05	96.94	118.45	89.38
2008	93.57	91.13	106.58	102.51	132.94	84.41
2009	87.85	80.53	99.89	102.74	151.4	86.24
2010	99.73	80.42	110.09	96.11	162.9	83.45

* For sterling 2005 average = 100

Source: Bank of England (ww.bankofengland.co.uk/markets/index.htm)

The following example shows how to construct the US dollar effective exchange rate from 2008 to 2009. For simplicity, we only select two of the top trading partners of the United States, Canada and Japan. The base year is 2008 with the value of 100. **Exhibit 3.5** gives the relative information.

Exhibit 3.5 Nominal exchange rates and trade volume to the U.S.

(millions of U.S. dollar)

Country	S (2008)	S (2009)	Exports to U.S.	Imports from U.S.
Canada	C\$1.03/\$	C\$0.99/\$	275	150
Japan	¥80/\$	¥85/\$	235	175

The weights assigned to the Canadian dollar and Japanese yen are determined by the importance of Canadian foreign trade to the U.S. and the importance of Japanese foreign trade accounting for the total foreign trade of the United States. The Canadian exports to and imports from the U.S. are \$425 million (\$275m + \$150m), which accounts for 50.90% (\$425m/\$835m) of the U.S. total foreign trade. Therefore, the weight assigned to the Canadian dollar should be 50.90%. The Japanese exports to and imports from the U.S. are \$410m (\$235m + \$175m). It accounts for 49.10% of the U.S. total foreign trade. So the weight of the Japanese yen should be 49.10%. The weights always sum to 1.

The effective exchange rate (EER) is constructed by calculating each of the bilateral exchange rates relative to the base-year exchange rate. The C\$/\$ rate in 2008 was 1.07 and 0.99 in 2009, and the ¥/\$ rate was 80 in 2008 and

85 in 2009. The dollar depreciated against the Canadian dollar and appreciated against the Japanese yen. Is the dollar "stronger" or "weaker" in general terms? In other words, since the value of the dollar in 2008 was set to 100, was the dollar value in 2009 below or above 100? That's what the effective exchange rate of the dollar will show.

As we know the value of the dollar in terms of Canadian dollar was 1.03 in 2008 and 0.99 in 2009, this means the value of the dollar in 2009 was 96.12% (0.99/1.03) of the 2008 value. By the same token, the value of the dollar in terms of Japanese yen in 2009 was 106.25% (85/80) of the 2008 value. The effective exchange rate for 2009 can be calculated as follows:

$$EER_{2009} = [(0.509)(0.9612) + (0.491)(1.0625)] \times 100 = 101.10$$

The value indicates that the average value of the US dollar against the Canadian dollar and the Japanese yen for 2009 was 101.10% of the value for 2008. Therefore, the dollar was "stronger" generally.

The real effective exchange rate index tells how the weighted average purchasing power of the currency has change relative to the selected base period. The difference between the nominal effective exchange rate and real effective exchange rate is that the latter is adjusted for the effects of inflation. To compute the real effective exchange rate, we have to use the real exchange rate instead of the nominal exchange rate. It means that we have to convert each nominal exchange rate in the currency baskets we have chosen to a real exchange rate. So we also need the information about the changes in prices of the relative countries. We then would complete the remaining calculations as described earlier.

Summary

1. Foreign exchange is simply another country's money. The most important character of the foreign exchange is convertibility. Foreign exchange rate is the price of one currency in terms of another.
2. The foreign exchange market serves two main functions. One is to convert one currency into another; the other is to provide some insurance against foreign exchange risk.

3. The foreign exchange market is the largest financial market in the world. The core of the foreign exchange market is the interbank market. It is an informal, over-the-counter, around-the-clock market that includes the major commercial banks and some specialized brokers in the principal financial centers throughout the world. They are linked by telephone and telex, and most use a special satellite communications network called SWIFT.
4. The interbank market is composed of dealers (traders) and brokers. The role of the dealer and the broker is essentially different. The dealer usually operates out of the foreign exchange trading room of a major bank and is essentially a market-maker, standing ready to buy and sell foreign currencies on a more or less continuous basis. The broker is an intermediary between traders, bringing buyers and sellers together and contributing to market efficiency. Brokers also serve as a source of information for traders and make it possible for traders to remain anonymous when revealing their identity would put them at a trading disadvantage.
5. The spot exchange market is for spot transactions. By convention, the settlement date or "value date" is the second business day from the "deal date".
6. Foreign exchange rates can be quoted in two ways: (a) the number of units of domestic currency for one unit of foreign currency known as the direct quotes, or (b) the number of units of foreign currency for one unit of domestic currency known as the indirect quotes. Most countries use direct quotes. The United Kingdom, EU and a few of former British colonies use indirect quote.
7. European quote is the foreign currency price of one U.S. dollar. American quote is the U.S. dollar price per foreign currency unit. European quote and American quote must involve the U.S. dollar.
8. The bid quote is the price at which the bank wants to buy; while the ask quote is the price at which the bank wants to sell. Costs or gains on foreign exchange transactions are in the form of bid-ask spreads. They are usually expressed as "points". The spread can also be expressed as a percent of the ask price known as the bid-ask margin.
9. A cross rate is the rate calculated from two bilateral exchange rates.

10. If a currency gains value in the foreign exchange market, the currency appreciates; if a currency loses value in the foreign exchange market, the currency depreciates. The appreciation and depreciation of a currency are usually measured by the percentage change.
11. Percentage changes in currency values are asymmetric. The value of the foreign currency in the denominator of an exchange rate quote changes according to the formula: [(Ending rate − Beginning rate)] / (Beginning rate).
12. The no-arbitrage condition for triangular arbitrage in the currency market is that the product of the three exchange rates equals to 1.
13. Forward exchange market is for forward transactions. Forward exchange rate is the price to be paid for delivery of a currency at a future date.
14. When a currency's forward rate is higher than the spot rate, the currency is traded at forward premium. When its forward rate is lower than the current rate, it is traded at the forward discount. Forward discounts and premiums make domestic currency cash flows differ from what they would be at the spot rate and the bid-ask spread accentuates the difference.
15. Forward exchange rate can be quoted outright or by basis points.
16. Changes in exchange rates can dramatically alter the profitability of foreign trade and investment deals. Financial managers must understand the potential risks the firms face when they are dealing with foreign currencies. Three types of exposure to foreign exchange risk are transaction exposure, translation exposure, and economic exposure.
17. Many techniques are available to cover or hedge exposure to risk of exchange rates. The simplest and most common technique involves using a forward contract.
18. A long position in foreign exchange can be hedged by selling foreign exchange forward. A short position can be hedged by buying foreign exchange forward.
19. Hedging has its disadvantages because, although it does eliminate adverse moves in the exchange rate, it also eliminates the possibility of benefiting from favorable moves.
20. Real exchange rate is the nominal exchange rate adjusted for relative changes in domestic and foreign price levels. So the real exchange rate

captures changes in the purchasing power of a currency relative to other currencies by backing out the effects of inflation from changes in nominal exchange rates.

21. Policy-makers are more concerned about what is happening to its own currency against a basket of foreign currencies with which the country trades. The effective exchange rate is a measure of whether or not the currency is appreciating or depreciating against a weighted basket of foreign currencies.
22. To construct the effective exchange rate, three steps must be followed: to choose the currency basket; to choose the base year and to assign the weights for each currency in the basket.

Key Terms

American terms (American quotes) (美式标价)
Appreciation (升值)
Arbitrager (套利者)
Ask quote (ask price, selling price, offer price) (卖出价)
Basis points (基点)
Bid quote (bid price, buying price) (买入价)
Bid-ask margin (买卖差价百分比)
Bid-ask spread (买卖差价)
Cross rate (交叉汇率)
Depreciation (贬值)
Direct quote (直接标价)
Economic exposure (经济敞口)
Effective exchange rate (有效汇率)
European terms (European quotes) (欧式标价)
Foreign exchange (外汇)
Foreign exchange arbitrage (套汇)
Foreign exchange broker (外汇经纪人)
Foreign exchange dealer (外汇交易商)
Foreign exchange market (外汇市场)
Foreign exchange market turnover (外汇市场交易量)

Foreign exchange rate (汇率)
Foreign exchange risk (汇率风险)
Forward exchange rate (远期汇率)
Forward discount (远期贴水)
Forward premium (远期升水)
Hedging (对冲,或套期保值)
Indirect quote (间接标价)
Long position (多头)
Market maker (做市商)
Nominal exchange rate (名义汇率)
Real effective exchange rate (实际有效汇率)
Real exchange rate (实际汇率)
Short position (空头)
Spatial arbitrage (两地套汇)
Speculator (投机商)
Spot exchange rate (即期汇率)
Spot transaction (即期交易)
Transaction exposure (交易敞口)
Translation exposure (转换敞口)
Triangular arbitrage (三角套汇)
Vehicle currency (载体货币)
SWIFT (Society for Worldwide Interbank Financial Telecommunications) (全球同业银行金融电信协会)

Questions

1. What are foreign exchange and foreign exchange rate?
2. What are the two main functions of the foreign exchange market?
3. Why does most interbank currency trading worldwide involve the U. S. dollar?
4. Distinguish a dealer from a broker in the foreign exchange market.
5. How is a foreign exchange speculator different from an arbitrager?
6. What is the motive of the central bank buying and selling foreign exchanges?

7. Define the direct and indirect quotes.
8. Explain the European and American quotes.
9. Explain the situation where the bid quote is higher than the ask quote.
10. What conditions must be satisfied for arbitragers to make profits in currency arbitrage?
11. Discuss the difference between the spot and forward markets.
12. What are the pros and cons to take the advantage of forward exchange market?
13. What is meant by a currency trading at a discount or at a premium in the forward market?
14. Compare and contrast the transaction, translation and economic exposures.
15. What is the difference between the nominal and real exchange rates?

CHAPTER 4
INTERNATIONAL MONETARY SYSTEM

LEARNING OBJECTIVES

- Understand the concept of international monetary system
- Examine the characteristics, pros and cons, and the fall of gold standard
- Learn the mechanism of the Bretton Woods system and its collapse
- Consider the floating exchange rate system and its characteristics
- Know the various exchange rate arrangements adopted by many countries nowadays
- Compare the arguments for the fixed and floating exchange rate regimes

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Exchange rate determination places a very important role in an open economy. Nowadays the foreign exchange market is the primary institution for determining exchange rates, and the impersonal market forces of demand and supply determine the relative value of any two currencies. In the later chapters, we will explain that the demand and supply of currencies are influenced by relative inflation rates and interest rates. When the foreign exchange market determines the relative value of a currency, we say that the country is adhering to a floating exchange rate regime. However, the exchange rates of many currencies are not determined by the free play of market forces, and other institutional arrangements are adopted.

In this chapter, we explain how the international monetary system works and point out its implications for international business. The international monetary system is the global environment within which international trade and investment and other economic activities can operate smoothly. It is actually an institutional framework within which international settlements are made and

the exchange rates among currencies are determined. To understand how the system works, we must review its evolution. We begin with a discussion of the gold standard, the mechanisms of the system and its breakup during the 1930s. Then we introduce the Bretton Woods system created in 1944 which was regarded as a very successful international monetary system after the World War II, and how the Bretton Woods system worked in the post-war period. Since the collapse of the Bretton Woods system in 1971, the world has operated with a mixed system in which some currencies are allowed to float freely, but many are either managed by government intervention or pegged to another currency. We examine the reasons for the failure of the Bretton Woods system as well as the nature of the present system. Different exchange rate systems are adopted by the different countries nowadays. We need to understand their meanings and characteristics. Finally, we compare the two most important exchange rate systems — the fixed and floating exchange rate systems.

Definition of the International Monetary System

International monetary system is broadly defined as a complex set of conventions, rules, procedures and institutions that govern the conduct of financial relations between nations. Usually the system needs to determine an international currency as a medium of exchange in international transactions, how the international currency is related to the currencies of different countries, how balance of payments disequilibrium is resolved and the consequences that the adjustment process will have on the countries involved. Different systems have different ways to deal with those issues.

The international monetary system is based on the exchange rate systems adopted by individual countries. An **exchange rate system** is a set of rules governing the value of a country's currency relative to other foreign currencies. The centerpiece of the international monetary system is to decide which currency should be used in international trade and other economic activities. Three kinds of money have been used as international currency.

Commodity money such as gold and silver was widely used in the early times. However, as the volume of international trade expanded in the wake of the Industrial Revolution, a more convenient means of financing international trade

was needed. Shipping large quantities of gold and silver around the world to finance international trade seemed impractical. The solution adopted was to arrange for payment in bank notes or drafts and for governments to agree to convert the bank notes into gold on demand at a fixed rate.

Commodity-backed money refers to mainly the bank notes which are backed by commodities like the gold or silver. The bank notes can be converted into gold or silver.

Fiat money is inconvertible money that is made legal tender by a government decree. Fiat money is backed by nothing; the only thing that gives the money value is the faith placed in it by the people that use it. Fiat money is money because the government says they are, not because they are backed by physical commodities. When the government is unable to repay all its debt in real values, fiat money with unlimited credit creation is a perfect solution. Once that confidence is gone, money irreversibly becomes worthless.

Now we briefly review the history of the international monetary system. It helps you to understand how alternative exchange rate systems affect asset values across national borders. This is essential knowledge for managing the value and financial risks of an individual investment portfolio or a multinational corporation.

The Gold Standard (1876 – 1944)

The **gold standard** was a commitment by participating countries to fix the prices of their domestic currencies in terms of a specified amount of gold, that is, to announce the **gold par value** (or **gold parity**). National money and other forms of money (bank deposits and notes) were freely converted into gold at the announced rate. The first full-fledged gold standard was established in Great Britain in 1821, when bank notes from the Bank of England were made fully redeemable for gold.

The Classical Gold Standard (1876 – 1914)

The period from 1876 to 1914 was known as the classical gold standard. During that time the majority of countries adhered to gold. France, Germany, the United Sates, and later Russia and Japan converted to the gold standard successively. It was also a period of unprecedented economic growth with

relatively free trade in goods, labor, and capital.

The gold standard was a domestic standard, regulating the quantity and growth rate of a country's money supply. Because new production of gold would add only a small fraction to the accumulated stock and because the authorities guaranteed free convertibility of gold into nongold money, the gold standard assured that the money supply and, hence, the price level would not vary much. But periodic surges in the world's gold stock, such as the gold discoveries in Australia and California around 1850, caused price levels to be very unstable in the short run.

The gold standard was also an international standard - determining the value of a country's currency in terms of other countries' currencies. Because adherents to the standard maintained a fixed price for gold, rates of exchange between currencies tied to gold were necessarily fixed. The gold standard is a typical fixed exchange rate system because the exchange rate is quite stable. A **fixed exchange rate** means that the value of a currency is fixed to something else. Under the gold standard, the value of a currency was fixed to gold. A fixed exchange rate does not necessarily mean the exchange rate never changes. It only means the flexibility of the exchange rate is limited to a narrow range, called a **parity band**, around the chosen fixed rate, called the **par value**. For example, as the **Figure 4. 1** shows the United States fixed the price of gold at \$20.646 per ounce; Britain fixed the price at £4.252 per ounce. The exchange rate between dollar and pound - "par exchange rate" - necessarily equaled \$4.856 per pound. \$4.856 was the par value or mint par of exchange rate.

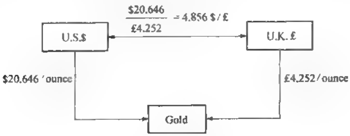

Figure 4. 1 Exchange rate determination under the gold standard

If the dollar/pound rate deviated from the par exchange rate, arbitrage opportunity would exist. This is because three conditions should be met for a

real gold standard. First, the gold coinage was unrestricteds which means people could bring the gold to a mint and ask for making gold coins; second, bank notes could be freely converted into gold and vice versa; third, gold could be freely exported or imported. Those conditions guaranteed that the exchange rate between the two currencies were necessarily stable. For example, if the U.S. dollar versus the British pound rate was 5 \$/£ instead of \$4.856/£, an arbitrager could pay \$20.646 for one ounce of gold in America. He then could sell the gold in England for £4.252. The £4.252 would have exchanged on the foreign exchange market for £4.252×5 \$/£, or \$21.26, earning a profit of \$0.614. Here we ignore the transportation costs of gold. Everyone would be selling pounds in the foreign exchange market but no one would be buying pounds. The excess supply of pounds would make the exchange rate fall to \$4.856/£, the point at which the arbitrage opportunity disappears.

In reality, dollar/pound rate in the foreign exchange market would just move around the par value plus and minus the transportation costs and other fees of the gold. Suppose that the fee to transport equivalent to £1 gold was \$0.0003. The dollar/pound exchange rate would fluctuate between \$4.8563/£ (4.856 +0.0003) and \$4.8557/£ (4.856−0.0003). The rate of \$4.8563/£ was the U.K. **gold import point** (U.S. gold export point) and the rate of \$4.8557/£ was the U.K. **gold export point** (U.S. gold import point). If the exchange rate in the market was above 4.8563, U.S. residents who owed pound debts would prefer paying gold; on the other hand, if the exchange rate was below 4.8557, those who had dollar debts would like to pay gold instead. The gold export and import points are actually the parity band of the exchange rate fluctuations. This example shows why the exchange rate under the gold standard was pretty stable as long as the gold par value of the relative currencies remained unchanged.

Because exchange rates were fixed, the gold standard caused price levels around the world to move together. This comovement occurred mainly through an automatic balance-of-payments adjustment process called the price-specie-flow mechanism.

The Balance-of-Payments Adjustment under the Gold Standard

The great strength claimed for the gold standard was that it contained a

powerful mechanism for achieving balance-of-payments equilibrium by all countries. A country is said to be in balance-of-payments equilibrium when the income its residents earn from exports is equal to the money its residents pay to other countries for imports (the current account of its balance of payments is in balance). The following example shows how the mechanism worked.

Suppose a technological innovation brought about faster real economic growth in the United States. With the supply of money essentially fixed in the short run (banknotes need to be backed by a gold reserve of a minimum stated ratio), this caused U.S. prices to fall. Prices of U.S. exports then fell relative to the prices of imports. This caused the British (and other countries) to demand more U.S. exports and Americans to demand fewer imports. A U.S. balance of payments surplus was created, causing gold (specie) to flow from the United Kingdom (and other countries) to the United States. The gold inflow increased the U.S. money supply, reversing the initial fall in prices. In the United Kingdom (and other countries) the gold outflow reduced the money supply and, hence, lowered the price level. The net result was balanced prices among countries and thus balanced balance of payments in the United States.

The fixed exchange rate also caused both monetary and nonmonetary (real) shocks to be transmitted via flows of gold and capital between countries. Therefore, a shock in one country affected the domestic money supply, expenditure, price level, and real income in another country.

For the gold standard to work fully, central banks were supposed to play by the "**rules of the game**". In other words, they were supposed to raise their discount rates — the interest rate at which the central bank lends money to member banks — to speed up a gold inflow, and lower their discount rates to facilitate a gold outflow. Thus, if a country was running a balance-of-payments surplus (deficit), the rules of the game required it to allow a gold outflow (inflow) until the ratio of its price level to that of principal trading partners was restored to the par exchange rate.

For example, Bank of England played by the rules over much of the period between 1870 and 1914. Whenever Great Britain faced a balance-of-payments deficit and Bank of England saw its gold reserve declining, it raised its "bank rates" (discount rate). By causing other interest rates in the United Kingdom to rise as well, the rise in the bank rate was supposed to cause holdings of

inventories to decrease and other investment expenditures to decrease. These reductions would then cause a reduction in overall domestic spending and a fall in the price level. At the same time, the rise in the bank rate would stem any short-term capital outflow and attract short-term funds from abroad.

Performance of the Gold Standard

The great virtue of the gold standard was that it assured long-term price stability. The quantity of money supply under the gold standard depended directly on the quantity of gold reserves the monetary authorities had. Since the supply of gold was rather constant and no one could increase its quantity at will, the money supply was stable and couldn't get out of control. Therefore, the countries' prices and exchange rates were relatively constant. Statistics show that the annual inflation rate was 0.1 percent between 1880 and 1914 while the average was 4.2 percent between 1946 and 1990. No wonder supporters of gold standard view it as an ultimate hedge against price inflation.

Another virtue of the gold standard is that it does not need a central bank. The function of monetary authorities is just to maintain the gold par value which is the amount of money needed to buy one ounce of gold. Canada and the United States, for example, did not have central banks until the early 1900s.

But because economies under the gold standard were so vulnerable to real and monetary shocks, prices were highly unstable in the short run. A measure of short-term price instability is the coefficient of variation, which is the ratio of the standard deviation of annual percentage changes in the price level to the average annual percentage change. The higher the coefficient of variation is, the greater the short-term instability will be. For the United States between 1879 and 1913, the coefficient was 17.0, which is quite high. Between 1946 and 1990 it was only 0.8.

Moreover, because the gold standard gives government very little discretion to use monetary policy, economies on the gold standard are less able to avoid or offset either monetary or real shocks. Real output, therefore, is more variable under the gold standard. This can explain that some times in the history some governments simply abandoned the gold standard in order to pursue certain national objectives. Since the government could not have discretion over monetary policy, unemployment was higher during the gold standard. It

averaged 6.8 percent in the United States between 1879 and 1913 versus 5.6 percent between 1946 and 1990.

Finally, any consideration of the pros and cons of the gold standard must include a very large negative: the gold is always such a scarce resource that the rapid growth in international trade and investment can be seriously hampered for the lack of sufficient monetary reserves. If we adopt gold standard today, we will face severe deflationary pressures. At the same time, resource cost of producing gold and the cost to manage a gold standard are huge. Milton Friedman estimated the cost of maintaining a full gold coin standard for the United States in 1960 to be more than 2.5 percent of GNP. In 1990 this cost would have been $137 billion.

The International Monetary System from 1914 to 1944

The gold standard worked adequately until the outbreak of World War I. The war caused Great Britain, France, Germany, and Russia to suspend redemption of banknotes in gold and impose embargoes on gold exports. Germany, Austria, Russia and other countries experienced hyperinflation. Those events threw the international monetary system into turmoil. During the World War I and the early 1920s, currencies were allowed to fluctuate over fairly wide ranges in terms of gold and each other. A lot of countries used "predatory" depreciation of their currencies as a means of gaining advantages in the world export market. International speculators were very active in the financial market. They sold the weak currencies and bought the strong currencies, causing the weak currencies to fall further and the strong currencies stronger.

As major countries began to recover from the war and stabilize their economies, they attempted to restore the gold standard. In 1925, a gold exchange standard was instituted in which the U.S. and U.K. held only gold reserves while other countries held gold, U.S. dollars and sterling pounds as reserves. This was a modified gold standard, because the U.S. and U.K. traded gold only with foreign central banks, not private citizens. The gold exchange standard lasted until 1931, at which time the U.K. withdrew from the system under pressure from massive demands on its reserves as a result of an unrealistically high pound sterling value. Despite coordinated international efforts to rescue the pound, British gold reserves continued to fall to the point

where it was impossible to maintain the gold standard. To maintain the competitiveness of their products on world markets, many other nations such as Sweden, Austria, and Japan followed the U.K. in getting off gold. The United States got off gold in 1933 after experiencing a spate of bank failures and outflows of gold. France abandoned the gold standard in 1936 because of the flight from the French franc.

From 1934 to the end of World War II, exchange rates were theoretically determined by each currency's value in terms of gold. As a matter of fact, paper standards came into being when the gold standard was virtually abandoned. Since the inconvertibility of the most currencies, currency speculation during this period was rampant, causing wild fluctuations in exchange rates. In sum, no coherent international monetary system prevailed during this period with profoundly detrimental effects on international trade and investment. As a result, the volume of international trade declined to a very low level with the protectionist policies adopted by many countries.

Bretton Woods System (1944 – 1971)

Bretton Woods Agreement

In 1944, at the height of World War II, representatives from 44 countries met at Bretton Woods, New Hampshire of the United States, to design a new international monetary system. The motivation behind creating a new international monetary system was the desire to avoid the breakdown in international monetary relations that had occurred in the 1930s. The 1930s were marked by major trade imbalances which in turn led to the adoption of widespread trade protectionism, the adoption of deflationary policies, competitive devaluations and the abandonment of the gold exchange standard. There was general consensus that fixed exchange rates were desirable.

The Bretton Woods Agreement reached in 1944 at Bretton Woods conference created the **International Monetary Fund (IMF)**. The IMF was responsible for coordinating the world monetary system. Its main function was to pool international reserves of member nations that could be loaned on a short-term basis to those members experiencing a shortage of foreign exchange reserves. Two other important institutions that arose at the end of the war were

the International Bank for Reconstruction and Development known today as the World Bank and the General Agreement on Tariffs and Trade (GATT). The **World Bank** financed postwar reconstruction and assisted in economic development with funds for social capital projects such as dams, ports, and other social infrastructure. The function of **GATT**, founded in 1948, was to promote the reduction of trade barriers and settle trade disputes among member nations.

The foreign exchange rate arrangement under this agreement was a fixed, but adjustable, exchange rate system. First, each nation fixed the value of their currencies to the U.S. dollar. For example, the gold parity of the British pound was 3.58134 gram of fine gold, and the good parity of U.S. dollar was 0.888671 gram of fine gold. Thus the dollar-per-sterling rate was fixed at 3.58134/0.888671 = 4.03£/\$. This exchange rate was the par value between the dollar and the sterling. Second, the dollar was the anchor of the system. The dollar was thus called the **anchor currency** to which other currencies were tied. The U.S. monetary authority promised to convert the dollar possessed by other monetary authorities to gold at the mint parity of \$35 to one ounce gold. Therefore, the system established the link between the U.S. dollar and gold, and the link among other nations' currencies and the U.S. dollar. Other nations' currencies were indirectly linked to gold. **Figure 4.2** depicts the Bretton Woods exchange rate system. Third, the **parity band** which was the width of the floating range of the par value was within 1% on either side. That is, for example, if one British pound is equal to 4.03 dollar, then, the width of the floating range of the pound should be between 4.0703 (4.03 + 0.0403) and 3.9897 (4.03 − 0.0403) dollar. Fourth, if the exchange rate deviated from the parity band, the monetary authorities should intervene in the foreign exchange market to maintain the par value. Finally, the par value was adjustable. It means when the government couldn't maintain its currency's value to the dollar, it could declare revaluation or devaluation of its own currency with the approval of IMF. **Revaluation** refers to a rise in the value of a country's currency by government decree; while **devaluation** refers to a fall in the price of a currency by government decree. Revaluation and appreciation, devaluation and depreciation are similar: revaluation and devaluation are generally used for a change in the exchange rate brought about as a matter of government policy,

whereas appreciation and depreciation occur gradually through the changes of demand and supply forces in the foreign exchange market.

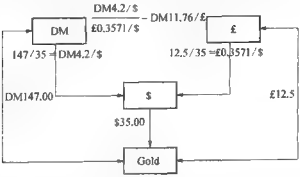

Figure 4.2 Bretton Woods exchange rate system

Under the Bretton Woods system, nations used the U. S. dollar to settle international claims and debts. This made the dollar primary reserve currency of the system, or the currency accepted as a means of exchange in international transactions. Typically, only the United States settled international debts with gold under this system.

The "Triffin Dilemma"

The Bretton Woods system ran smoothly and looked successful for almost two decades after the World War II. The system provided world economy with a stable exchange rate arrangement. It promoted economic growth of many nations and a rapid increase in world trade. The Bretton Woods system was not without its shortcomings, however. Since there was a limit to the U. S. gold stock, the dollar would not increase in value relative to gold, but it could always decrease in value. When the U. S. experienced long-term deficits of its international balance of payments, it would be very difficult for U. S. to maintain the dollar's mint parity to gold.

Well before the eventual demise of Bretton Woods system, Robert Triffin (1960) had predicted an eventual loss of confidence in the system. Triffin argued that there was an inherent contradiction in the gold-dollar standard. For the Bretton Woods system to function successfully it was essential that confidence was maintained in the U. S. dollar; so long as central banks knew

that dollars could be converted into gold at \$ 35 per ounce they would willingly hold dollars in their reserves. Triffin pointed out that as international trade grew, so would the demand for international reserves, namely U.S. dollars. To meet the demand for these reserves the Bretton Woods system depended on the U.S. running deficits, with other countries running surpluses and purchasing dollars to prevent their currencies appreciating. Hence, over time, the stock of U.S. dollar liabilities to the rest of the world would increase and this rate of increase would be higher than the annual addition to the U.S. good reserves resulting from gold-mining activities. As a result, the ratio of U.S. dollar liabilities to gold held by the U.S. Federal Reserve would deteriorate until eventually the convertibility of dollars into gold at \$ 35 per ounce would become de facto impossible.

As it became apparent that the U.S. authorities would not be able to fulfill their convertibility commitment, Triffin predicted that central banks would begin to anticipate a devaluation of the dollar rate against gold. In anticipation of this, central banks would start to convert their reserves into gold and stop pegging their currencies against the dollar leading to an inevitable breakdown of the system. In brief, the "Triffin dilemma" was that the U.S. could run neither balance-of-payments deficit nor surplus under the Bretton Woods system. This is because continued U.S. deficits would undermine the Bretton Woods system, yet if the U.S. took measures to curb its deficits this would lead to a shortage of world reserves which would undermine the growth of world trade and exert deflationary pressures on the world economy. Just as Mr. Triffin predicted, the fact that the U.S. was unable to fulfill the convertibility commitment contributed to the eventual collapse of the Bretton Woods system.

Decline of Bretton Woods System

The system was well-designed for the immediate post-war international economy. Through the 1950s and into the 1960s, the international economy outgrew the system. European economies grew rapidly, and the American dollar's strength declined. American dollars were being spent overseas, in the form of foreign aid, defense spending, investment, trade, and tourism. This outpouring of dollars into the international economy was not reciprocated by an equal inflow of currency. This brought about a deficit in the capital account,

resulting in a balance-of-payments deficit.

To control the balance-of-payments deficit, the federal government adopted a number of measures to help bring about equilibrium beginning in the late 1950s. Foreign aid was tied to purchases of goods and services in the United States, so that aid outflows could be counteracted. Duty-free allowances were reduced for American tourists returning from travels abroad. Government agencies reduced their overseas spending. The Federal Reserve lowered the ceiling on bank loans to foreigners. A number of other measures were taken, including the creation of a **gold pool** funded by the central banks of several industrial nations to intervene in the London gold market to maintain the official price of gold.

The countermeasures of the 1950s and early 1960s had proven insufficient to remove the deficit. All the methods of reducing the balance-of-payments deficit were in opposition to the economic goals that Kennedy administration had articulated. Reducing federal spending might have eroded the United States' position as an important international power in the post-war Cold-war international political scene. Kennedy's economists were also reluctant to raise interest rates, especially on long-term investments, since such an action might have discouraged domestic entrepreneurs, thus slowing growth. The third option, to devalue the currency, was not possible under the Bretton Woods system, since, as the anchor of the monetary system, the American dollar was the only currency that could not be devalued or revalued, even in a state of fundamental disequilibrium.

The problem of the American balance-of-payments deficit was becoming more pressing, and increased military spending in Vietnam was exacerbating the difficulties. Nevertheless, none of the remedy policies were able to even stop the growth of the capital account deficit, let alone reverse the trend. By 1964, the capital account deficit had increased tremendously, pushing the balance of payments further into deficit despite the $2.4 billion increase in the current account balance.

Dollar Crises

The fact that more currency was flowing out of the United States than was coming in meant that the Federal Reserve's foreign currency reserves were in danger of being seriously depleted. Since holding a dollar represented a

guarantee that one could exchange it for foreign currency or for gold at any time, such a depletion of currency could cause a crisis of confidence and a massive panic. The **dollar crisis**, a run on the dollar, in which large numbers of people attempted to sell their dollars to the Federal Reserve, could occur, causing the Fed to approach insolvency.

There were two serious American dollar crises in the 1960s. The first occurred in the early months of 1965. Among the contributing factors were the worsening situation in Vietnam; the rumor that the United States intended to eliminate the gold reserve requirement against Federal Reserve deposits and notes, and French verbal attacks on the role of the dollar in the international monetary system. In March, 1965, the price of gold peaked at $35.17 an ounce and the United States had to find a way to bring the price back down to $35.00 in order to maintain the dollar's value in the Bretton Woods system. The Congress freed about $4.9 billion worth of gold in order to meet potential international claims on American gold reserves.

The second crisis occurred in 1968, when there was a drastic increase in purchases of gold. The seven major industrial countries (members of the gold pool) could not maintain the market price of gold at $35 an ounce, so they gave up their efforts (the gold pool was officially closed in that year), except for the United States, which agreed to continue selling gold to governments at $35 an ounce. In order to support this commitment, U.S. congress freed more gold ($10.7 billion) from currency reserves. On the other hand, to partially alleviate the pressure on the dollar as the international reserve currency, the IMF created an artificial international reserve called the **special drawing rights (SDRs)** in 1969. At that time the SDR was a weighted average of various convertible currencies including the U.S. dollar, the Deutsch mark, the Japanese yen, the British pound and the French franc. Nowadays, the SDRs include the U.S. dollar, the Euro, the Japanese yen and the British pound. SDRs are allocated to IMF member nations to supplement their reserve assets. Member countries can use SDRs for settlements among themselves or with the IMF. SDRs are reserve assets of the government and can only be used in government transactions.

The Breakdown of the Bretton Woods System

The efforts to support the U.S. dollar and the Bretton Woods system,

however, turned out to be ineffective and did not stop the speculation built up by the continual U.S. balance-of-payments deficits, the expansionary monetary policy and rising inflation. One statistic showed that U. S. official reserve assets, primarily gold, fell to about $12 billion in 1971, whereas U.S. liquid liabilities to all foreigners rose to more than $88 billion at the same time①. Obviously, if those debts were presented to the U.S. government in return for gold, the entire U.S. reserves of gold could be depleted. Eventually, in August 1971, as the U. S. trade deficit continued to expand, the United States suspended the convertibility of the dollar into gold or other reserve assets. President Richard Nixon announced an emergency 10% tariff on all US imports as an interim measure until US trading partners agreed to revalue their currencies against the dollar. He also announced some domestic polices designed to stabilize the US inflation rate; these included price and wage controls. The world's exchange rate system was in disarray. Consequently, international trade between nations also fell into a chaotic state.

Smithsonian Agreement (Dec. 1971)

The immediate response of foreign governments to the Nixon measures was along the lines sought by the US administration. Foreign governments allowed their exchange rates to float and agreed to a further liberalization of trade barriers. In a bid to restore the pegged exchange rate system, the G-10 nations met in December at the Smithsonian Institute in Washington. They tried to tackle the problem of the overvalued dollar by devaluing it against gold from $35 to $38 and revaluing currencies against the dollar by an average of 8%. In addition, the margin by which other currencies could fluctuate against the dollar was widened from ± 1 to $\pm 2.25\%$. In return for the revaluations, the US agreed to remove its 10% import tariff. In 1972, the U.S. trade deficit nearly tripled from 1971, and speculative flows of currencies continued, resulting in the international monetary crisis of February 1973.

After the Smithsonian Agreement, several industrial countries led their currencies to float. During that period, the official desire for fixed exchange rates had remained strong, but any hopes of a return to fixed parities were

① Bureau of Economic Analysis: International Investment Position Statistics.

overtaken by events. The first cause was that the U.S. government switched to advocacy of floating rates. It was reluctant to intervene in the foreign exchange market when the dollar exchange rate moved favorable to the U.S. economy. The second cause was that the oil crisis hurt both developed and developing countries. In 1973, OPEC quadrupled the price of oil which had a huge impact on the world economy and effectively ended any hopes of restoring a fixed exchange rate system. The huge oil price rise caused the developed countries such as Japan and the United Kingdom to suffer significant balance-of-payments deficits during the period of 1973 and 1975. Less-developed countries were also hard hit by the soaring oil prices. Their costs of importing oil were increased dramatically. Their export earnings were reduced tremendously because of the recession in the industrialized countries.

In February 1973, the U. S. dollar was devalued again because of the selling pressure in the world market. The price of gold was further raised from $38 to $42 per ounce. By March 1973, major currencies like the Japanese yen, the British pound and the Deutsch mark began to float against each other. The decline and fall of the Bretton Woods system was completed. The world entered the new era of floating exchange rate system.

Floating Exchange Rate System (1973 – Now)

The **floating exchange rate** is the rate free to go wherever the market equilibrium is. The government lets the market determine the exchange rate. There are two kinds of floating exchange rate: clean float and managed float. **Clean float rate** refers to the exchange rate solely determined by the market forces. In some countries, the exchange rates are basically determined by the supply and demand in the foreign exchange market. The governments, however, often try to have a direct impact on the exchange rates through official intervention. In this case, the countries are said to adopt **managed float rate** system. The managed float is sometimes called the **dirty float**.

The Jamaica Accord (1976)

Although the world was operating under a floating rate system, it was illegal from the viewpoint of the IMF, because the constitution of the IMF

forbade floating rates. In January 1976, the members of the IMF amended the constitution of the IMF, thus formally legitimizing the new floating exchange rate system. The key elements of the Jamaica Accord include: 1) Member countries were basically free to choose any exchange rate system they wanted. 2) Gold was abandoned as a reserve asset. 3) The conference aimed at increasing the importance of SDRs in international reserves, and there was a declaration that the SDR should become the "principal reserve asset". After Jamaica accord, the IMF continued its role of helping countries cope with macroeconomic and exchange rate problems, albeit within the context of a radically different exchange rate regime.

The Plaza Agreement (1985) and the Louvre Accord (1987)

The Jamaica Accord amended the constitution of the IMF to allow, among other things, each member nation to determine its own exchange rate arrangement. Thus a new era of floating exchange rate system occurred. Actually, the floating rate system is not a true flexible exchange rate system. It is a managed float system (dirty float), which is a system of flexible exchange rates but with periodic intervention by monetary authorities.

This can be proved by the two events in the 1980s. First, the **Plaza Agreement** in 1985 was to reduce the speculation for the U.S. dollar. The U.S. economy experienced high inflation and high unemployment in the 1980s. The high U.S. interest rates attracted international capitals from all over the world. As a result, the dollar had a relentless substantial appreciation from 1980 to 1985. The dollar nominal effective exchange rate appreciated by around 50% and even more in real terms as the **Figure 4. 3** shows. The group of five (France, Germany, Japan, the United Kingdom, and the United States) met at the Plaza Hotel in New York in September, 1985 to reach the Plaza Agreement. The purpose was to intervene collectively to drive down the value of the dollar. The efforts by the central bankers of the group five appeared to achieve its goal and the dollar did depreciate against the major currencies within the next two years. The dollar had declined 13% from its high until the time of the Plaza Agreement. Second, the 1987 **Louvre Accord** was, on the other side, to declare that the monetary authorities would cease to drive down the value of the dollar, because the dollar had fallen to the same

price where it had started in 1981. G-7 countries would only intervene in the foreign exchange market as needed to ensure stability. The dollar decline had ended by the following year.

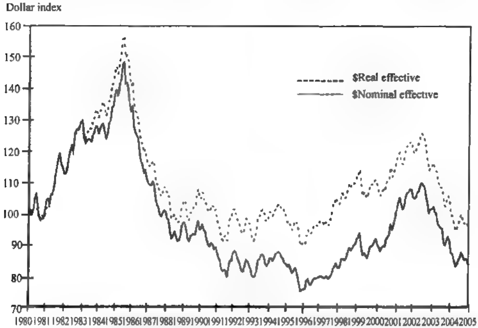

Figure 4.3 The nominal and real effective exchange rate of the dollar, 1980 – 2005

Source: *International Finance*, 3rd edition by Keith Pilbeam China People's University Press, 2009, p. 252

The Creation of the Euro

The 1991 Treaty of Maastricht and European Monetary Union: The most important international monetary development of the last half century is **European Economic and Monetary Union (EMU)**, which aims for economic and monetary union within EMU countries. EMU is a single-currency area within the European Union (EU) single market, now known as the euro zone, in which people, goods, services, and capital are supposed to move without restrictions. To achieve this objective, participating countries traded their currencies for the euro (€).

The timetable for EMU was established in the **1991 *Treaty of Maastricht*** and included the following dates:

- *January 1, 1999.* The euro replaced the European Currency Unit (ECU) in

the European exchange rate mechanism, becoming a unit of account but not yet a physical currency. ECU was a basket currency constructed as a weighted average of the currencies of member countries of the European Union back to 1979. Beginning in 1999, the exchange rates of participating countries were pegged to the euro at that time.

- *January 1, 2002*. The euro began public circulation alongside national currencies.
- *July 1, 2002*. The euro formally replaced the currencies of participating countries.

To prepare for the EMU, the Maastricht Treaty called for the integration and coordination of the member countries' monetary and fiscal policies. The EMU would be implemented by a process called convergence. Before becoming a full member of the EMU, each member country was originally expected to meet the following convergence criteria:

- Inflation rates should not be more than 1.5% above that of the three members of the EU with the lowest inflation rates during the previous year.
- Long-term interest rates should not be more than 2% above that of the three members of the EU with the lowest interest rates.
- Budget deficits should be no higher than 3% of gross domestic product.
- Government debt should be less than 60% of gross domestic product.

Originally, only 11 countries met the convergence criteria. Up till now there are 16 countries that use the euro. The euro began trading on world currency markets in 1999. It had a parity of $1.17/€ against the U.S. dollar and many economists expected it to strengthen. But contrary to expectations the first few years of its existence the value of the euro slid steadily following its introduction. However, as **Figure 4.4** shows, the euro has since made a dramatic recovery and the U.S. dollar has declined in value in part due to concerns about the need to correct an ever-widening U.S. current account deficit. The euro's future looks to be bright because of the various safeguards that have been put in place to ensure that it will be a sound low-inflation currency.

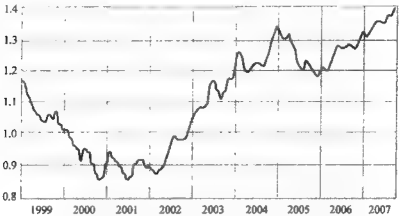

Figure 4.4 The Dollar/Euro Spot Exchange Rate, 1990 – 2007 (Monthly Average)

Note: Time period shown in diagram: 1/Jan/1990 - 27/Sep/2007
source: © 2007 by Prof. Werner Antweiler, University of British Columbia, Vancouver, BC, Canada

Currency Turmoil and Crises post – 1990

The Mexican Peso Crisis of 1995: During December 1994 and January 1995, the Mexican peso lost 40% of its value against the US dollar because of the political turmoil. International mutual funds had invested more than $45 billion in Mexico securities during a three-year period prior to the peso crisis. After the Mexico new president devalued the peso against the dollar by 14%, investors started to sell pesos as well as Mexican stocks and bonds. A capital flight from Mexico resulted from the panic among international investors. The Mexican stock market also fell 50% in peso terms during this time. The Peso crisis not only adversely affected the Mexican economy, but also led to significant falls in many other developing countries' stock markets and currencies, and this process of contagion from the Mexican markets to other developing countries gave rise to the so-called "Tequila effect". The US and IMF assisted the Mexico to overcome the crisis, so the crisis was relatively short-lived and in 1996 the Mexican economy rebounded strongly.

The Asian Contagion of 1997: In May 1997, the Thai baht came under pressure as speculators bet against the currency, which was pegged to a currency basket that included the US dollar. As the property and stock market bubbles

began to burst there was a rush on the part of international investors to exit Thailand. The substantial capital outflows made the country's foreign currency reserves severely depleted as the Bank of Thailand defended the currency. The foreign exchange reserves fell from nearly \$40 billion in December 1996 to less than \$10 billion by July 1997. On July 2, 1997, Thailand allowed the baht to float. By the end of 1997, the baht had lost nearly 50% of its value against the dollar.

The "Asian contagion" soon spread to Indonesia and South Korea. By the end of January 1998, the rupiah had lost more than 75% of its value against the dollar, and Indonesia's stock market fell by 33% near the end of 1997. The South Korean won lost nearly 44% against the dollar and the Korean stock market lost more than 50% of its value between September 1997 and September 1998.

The Fall of the Russian Ruble in 1998: Russia embarked on a painful transition toward a market-based economy after the breakup of the Soviet Union in 1991. Russia's difficulties during this transition included hyperinflation, an undeveloped banking system, widespread tax avoidance, corruption, and huge budget deficits. In 1998, the ruble came under speculative pressure as investors reassessed the viability of emerging market investments following the Asian crisis of 1997. By July 1998, Russia was finding it difficult to refinance its dollar debt as it matured. In August, Russia was forced to abandon its exchange rate peg and defaulted on more than \$40 billion of debt.

2002 Argentine Peso Crisis: The overvalued Argentine peso contributed to a severe depression beginning in 1998. The Argentina government had financed its large budget deficits with foreign currency debt, accumulating a balance of more than \$150 billion. The government was forced to devalue the peso in 2002 and eventually allowed the peso to float. As of January 2003, 40% of Argentina's population was living in poverty, unemployment was approaching 20%, and Argentina owed \$10 billion to the IMF.

Exchange Rate Systems in Practice

Since 1973, exchange rates have become much more volatile and less predictable than they were before. Governments around the world pursue a

number of different exchange rate policies. Today's international monetary system is a mixture of all currency regimes. These range from a pure "free float" where the exchange rate is determined by market forces to a pegged system that has some aspects of the Bretton Woods system of fixed exchange rates. In 2004, some 19% of the IMF members allowed their currencies to float freely. Another 26% intervened in only a limited way (the managed float). A further 22% of IMF members now have no separate legal tender of their own. These include the 16 EU countries that have adopted the euro, and effectively given up their own currencies, along with 29 smaller states mostly in Africa or the Caribbean that have no domestic currency and have adopted a foreign currency as legal tender within their borders, typically the US dollar or the euro. The remaining countries use more inflexible system, including a fixed peg arrangement (22%) under which they peg their currencies to other currencies, such as the US dollar or the euro, or to a basket of currencies. Other countries have adopted a somewhat more flexible system under which their exchange rate is allowed to fluctuate against other currencies within a target zone. Here we are going to examine the mechanism and implications of several exchange rate systems.

Crawling pegs

The **crawling peg** is an exchange rate system in which a country pegs its currency to another nation's currency, but allows the parity value to change up to a given percentage. It is a compromise between fixed and floating rates. Central bank interventions in the foreign exchange market may occur to maintain the temporary fixed rate. However, central banks can avoid interventions and save reserves by adjusting the fixed rate instead. Suppose that the Mexico central bank set the par value at 10 Mexican pesos to 1 U.S. dollar and allowed plus and down 3% fluctuations around the par value between 10.3 pesos and 9.7 pesos. If in the foreign exchange market, the dollar approaches 10.3 pesos, the Mexico central bank sells dollar for peso. On the other hand, if the dollar falls to near 9.7, the central bank buys dollar with peso. If the peso/dollar exchange rate stays near 10.3 for a long time even after the market intervention, the Mexico central bank can then adjust the par value to 10.3 pesos per dollar with the new limit points at 10.6090 and 9.9910.

Since crawling pegs are adjusted gradually, they can help eliminate some exchange rate volatility without fully constraining the central bank with a fixed rate. The crawling peg system has been used primarily by nations having high inflation rates. For example, in the 1990s, Mexico had fixed its peso with the U.S. dollar. However, due to the significant inflation in Mexico, as compared to the U.S., it was evident that the peso would need to be severely devalued. Because a rapid devaluation would create instability, Mexico put into place a crawling peg exchange rate adjustment system, and the peso was slowly devalued toward a more appropriate exchange rate.

The crawling peg differs from the system of adjustable pegged rates. Under the adjustable peg, currencies are tied to a par value that changes infrequently (perhaps once every several years) but suddenly, usually in large jumps. The idea behind the crawling peg is that a nation can make small, frequent changes in par values, perhaps several times a year, so that they creep along slowly in response to evolving market conditions.

Currency baskets

Currency baskets, also called a currency-basket peg exchange rate system, mean that a currency is pegged to a weighted average of a number of foreign currencies. This is simply because the weighted average of a basket of currencies is likely to be less variable than the exchange rate of a single currency. A stable exchange rate system can reduce exchange rate volatility and uncertainty and may yield gains in economic efficiency. China is actually adopting the currency-basket peg system.

The choice of currencies to be included in the basket is similar to the choice made in constructing an effective exchange rate. The choice of weights reflects the relative importance of each currency in the nation's international transactions.

Currency boards

In most countries today, the monetary authority is a central bank. A typical central bank today is a wholly government-owned body, separate from the ministry of finance that has a monopoly of issuing notes and coins. A typical central bank today has a high degree of discretionary power: it is constrained by

no monetary rule, such as a binding commitment to a particular exchange rate or inflation rate.

Among the other monetary systems that once were widespread were currency boards. Unlike the rest of the monetary system, which have all but vanished, currency boards have enjoyed a revival of interest since about 1990. A few countries have established currency board-like systems, and others have debated whether to have currency boards.

A **currency board** is a monetary authority that issues notes and coins convertible into a foreign anchor currency or commodity (also called the reserve currency) at a truly fixed rate and on demand. An orthodox currency board typically does not accept deposits. A currency board can operate in place of a central bank or as a parallel issuer alongside an existing central bank; cases of parallel issue have been quite rare, though.

Currency boards supply currency on the basis of 100 percent foreign reserves. For example, if the currency board in Hong Kong issues one Hong Kong dollar, and the fixed exchange rate it maintains is HK $ 7.75 per U.S. dollar, anybody who wants to obtain HK $ 7.75 from the currency board has to give it $ 1, and anybody who has Hong Kong dollars issued by the currency board can require it to give up $ 1 for every HK $ 7.75. As reserves, a currency board holds low-risk, interest-bearing bonds and other assets denominated in the anchor currency. A currency board's reserves are equal to 100 percent or slightly more of its notes and coins in circulation, as set by law. A currency board generates profits from the difference between the interest earned on its reserve assets and the expense of maintaining its liabilities — its notes and coins in circulation. It remits to the government all profits beyond what it needs to cover its expenses and maintain its reserves at the level set by law. An orthodox currency board has no discretion in monetary policy; market forces alone determine the money supply.

Currency boards can confer considerable credibility on fixed exchange rate regimes. The most vital contribution a currency board can make to exchange rate stability is by imposing discipline on the process of money creation. This results in greater stability of domestic prices, which, in turn, stabilizes the value of the domestic currency. The developing or emerging market economy is likely to choose the currency boards.

Dollarization

Dollarization means that a country uses the currency of another nation to serve as legal tender. The dollarization, like currency board was used by small developing nations. Many of the economies opting for dollarization already use foreign tender in private and public transactions, contracts, and bank accounts; however, this use is not yet official policy, and the local currency is still considered the primary legal tender. By deciding to use the foreign tender, individuals and institutions are protecting against possible devaluation of the local exchange rate. Full dollarization, however, is an almost permanent resolution: the country's economic climate becomes more credible as the possible speculative attack on the local currency and capital market virtually disappears. The small nations can achieve economic stability through dollarization. The main reason a country would do this is to reduce its country risk, thereby providing a stable and secure economic and investment climate. Countries seeking full dollarization tend to be developing or transitional economies, particularly those with high inflation. The diminished risk encourages both local and foreign investors to invest money into the country and the capital market. And the fact that an exchange rate differential is no longer an issue helps reduce interest rates on foreign borrowing.

Disadvantages of Dollarization

There are some substantial drawbacks to adopting a foreign currency. When a country gives up the option to print its own money, it loses its ability to directly influence its economy, including its right to administer monetary policy and form of exchange rate regime.

The central bank loses its ability to collect "**seigniorage**", the profit gained from issuing coinage (the minting of monies costs less than the actual value of the coinage). Instead, foreign central banks such as the U.S. Federal Reserve collect the seigniorage, and the government and gross domestic product (GDP) as a whole thus suffer a loss of income.

In a fully dollarized economy, the central bank also loses its role as the lender of last resort for its banking system. It may still be able to provide short-term emergency funds from held reserves to banks in distress; it would not necessarily be able to provide enough funds to cover the withdrawals in the case of a run on deposits.

Finally, because a local currency is a symbol of a sovereign state, the use of foreign currency instead of the local one may damage a nation's sense of pride.

Advantage of Dollarization

Besides reducing risk and protecting against inflation and devaluation, there are some compelling reasons for a country to decide to give up so much control over its economy.

As we mentioned above, full dollarization creates positive investor sentiment, almost extinguishing speculative attack on the local currency and exchange rate. The result is a more stable capital market, the end of sudden capital outflows, and a balance of payments that is less prone to crises.

Last but not least, full dollarization can improve the global economy by allowing for easier integration of economies into the world's market.

Arguments for Fixed and Floating Exchange Rates

The breakdown of the Bretton Woods system has not stopped the debate about the relative merits of fixed versus floating exchange rate regimes. Disappointment with the system of floating rates in recent years has led to renewed debate about the merits of fixed exchange rates. In this section, we review the arguments for fixed exchange rate regimes. We also discuss the case for floating rates before discussing why many commentators are disappointed with the experience under floating exchange rates and yearn for a system of fixed rates.

The Key Arguments for Floating Exchange Rates

The case in support of floating exchange rates has three main elements: automatic balance-of-payments adjustments, monetary policy autonomy, and economic stability.

Automatic Balance-of-Payments Adjustments

One advantage claimed for floating rates is their simplicity and easier balance-of-payments adjustment. Floating rates allegedly respond quickly to changing supply and demand conditions, clearing the market of shortages or surpluses of a given currency. Under the Bretton Woods system, if a country

developed a permanent deficit in its balance of payments that could not be corrected by domestic policy, this would require the IMF to agree to a devaluation of the deficit country's currency. Under the floating rate system, deficit country's currency will simply depreciate to the level at which there is no excess supply of the deficit country's currency. After the depreciation, the exports are cheaper and the imports are more expensive. The deficit country will automatically restore to the BOP equilibrium. The supporters of the floating rate system claim that the adjustment mechanism works more smoothly under the floating rate system than that under the fixed rate system.

Monetary policy autonomy

It is argued that under a fixed system, a country's ability to expand or contract its money supply as it sees fit is limited by the need to maintain exchange rate parity. Monetary expansion can lead to inflation, which puts downward pressure on a fixed exchange rate. Similarly, monetary contraction requires high interest rates (to reduce the demand for money). Higher interest rates lead to an inflow of money from abroad, which puts upward pressure on a fixed exchange rate. Thus, to maintain exchange rate parity under a fixed system, countries were limited in their ability to use monetary policy to expand or contract their economies.

Advocates of a floating exchange rate regime argue that removal of the obligation to maintain exchange rate parity would restore monetary control to a government. The government can use its monetary and fiscal policies to pursue whatever economic goals it chooses. If a government faced with unemployment wanted to increase its money supply to stimulate domestic demand and reduce unemployment, it could do so unencumbered by the need to maintain its exchange rate. While monetary expansion might lead to inflation, this would lead to the depreciation in the country's currency. If PPP theory is correct, the resulting currency depreciation on the foreign exchange markets should offset the effects of inflation. Although under a floating exchange rate regime, domestic inflation would have an impact on the exchange rate, it should have no impact on businesses' international cost competitiveness due to exchange rate depreciation. The rise in domestic costs should be exactly offset by the fall in the value of the country's currency on the foreign exchange markets. Similarly, a government could use monetary policy to contract the economy without

worrying about the need to maintain parity.

Economic stability

Someone argued that floating exchange rates are more conducive to economic stability. The exchange rate is a variable which can easily rise or fall whereas domestic prices tend to be very difficult to reduce. Hence, if there is a loss of international competitiveness it is better to allow the exchange rate to depreciate rather than maintain a fixed exchange rate and require deflationary policies to restore international competitiveness. Since the domestic price level is resistant to downward pressure, it may require quite severe deflationary policies with associated high unemployment to induce the fall in domestic wages and prices necessary to restore international competitiveness.

The floating exchange rate insulates national economies from disturbances coming from abroad. A country could neither import foreign inflation nor export its home-grown domestic inflation under the floating rate system, for movements in the exchange rates would compensate at the border for disturbances originating on the other side.

The Key Arguments for Fixed Exchange Rates

The case for fixed exchange rates rests on arguments about monetary discipline, speculation, uncertainty, and the lack of connection between the trade balance and exchange rates.

Monetary discipline

The need to maintain the fixed exchange rate parity ensures that a government does not expand its money supply at inflationary rates. Advocates of fixed rates argue that governments all too often give in to political pressures and expand the monetary supply far too rapidly, causing unacceptably high price inflation. A fixed exchange regime would ensure that this does not occur.

Speculation

Critics of a floating exchange rate regime also argue that speculation can cause fluctuations in exchange rates. For example, if foreign exchange dealers see a currency depreciating, they tend to sell the currency in the expectation of future depreciation regardless of the currency's longer-term prospects. As more traders jump on the bandwagon, the expectations of depreciation are realized.

Such destabilizing speculation tends to accentuate the fluctuations around the exchange rate's long-term value. It can damage a country's economy by distorting export and import prices. Thus, advocates of a fixed exchange rate regime argue that such a system will limit the destabilizing effects of speculation.

Uncertainty

Speculation also adds to the uncertainty surrounding future currency movements that characterizes floating exchange rate regimes. Floating rates have made business planning difficult, and they add risk to exporting, importing, and foreign investment activities. Advocates of the fixed exchange rate system argue that a fixed rate, by eliminating such uncertainty, promotes the growth of international trade and investment.

Competitiveness in foreign trade

Countries prefer a fixed exchange rate regime for the purposes of export and trade. By controlling its domestic currency a country can — and will more often than not — keep its exchange rate low. This helps to support the competitiveness of its goods as they are sold abroad. For example, let's assume a stronger U.S. dollar versus RMB exchange rate. Given that the dollar is much stronger than the RMB, a jean can cost a company five times more to produce in a U.S. company as compared to the company in China.

But the real advantage is seen in trade relationships between countries with low costs of production (like Thailand and Vietnam) and economies with stronger comparative currencies (the United States and European Union). When Chinese and Vietnamese manufacturers translate their earnings back to their respective countries, there is an even greater amount of profit that is made through the exchange rate. So, keeping the exchange rate low ensures a domestic product's competitiveness abroad and profitability at home.

The choice between the fixed and floating exchange rate system involves a trade-off between national policy autonomy and international economic integration. Countries like industrialized nations that pursue their domestic economic goals prefer floating exchange rate regime. On the other hand, most developing countries that commit to promoting international economic integration like the fixed exchange rate system.

Summary

1. The exchange rate system is a set of rules established by a nation to govern the value of its currency relative to foreign currencies.
2. The international monetary system is defined as a set of conventions, rules, procedures and institutions that govern the conduct of financial relations between nations. It is based on the exchange rate system adopted by individual countries.
3. The gold standard is a monetary standard that pegs currencies to gold and guarantees convertibility to gold. It was thought that the gold standard contained an automatic mechanism (price-specie-flow mechanism) that contributed to the simultaneous achievement of a balance-of-payments equilibrium by all countries. The gold standard finally broke down during the 1930s as countries were engaged in competitive devaluations.
4. The Bretton Woods system of fixed exchange rates was established in 1944. The U.S. dollar was the central currency of this system; the value of every other currency was pegged to the value of the dollar. The dollar also served as vehicle and reserve currency in this system. Significant exchange rate devaluations were allowed only with the permission of the IMF.
5. The fixed exchange rate system collapsed in 1973, primarily due to speculative pressure on the dollar following a rise in U.S. inflation and a growing U.S. balance-of-payments deficit.
6. Since 1973 the world has operated with a floating exchange rate regime, and exchange rates have become more volatile and far less predictable. Volatile exchange rate movements have helped reopen the debate over the merits of fixed and floating systems.
7. Jamaica Accord made the floating exchange rate legal. The agreement officially abandoned the gold as reserve assets and tried to increase the role of special drawing rights in international settlements.
8. The managed floating exchange rate means the exchange rates are basically determined by the market forces but with periodic intervention by the monetary authorities. The Plaza Agreement and the Louvre Accord are two examples for managed floating exchange rate.
9. In today's international monetary system, some countries have adopted

floating exchange rates, some have pegged their currency to another currency such as the US dollar, and some have pegged their currency to a basket of other currencies, allowing their currency to fluctuate within a zone around the basket.

10. The European Economic and Monetary Union (EMU) is a single-currency area within the European Union (EU) single market, now known as the euro zone, in which people, goods, services, and capital are supposed to move without restrictions.
11. Before becoming a full member of the EMU, each member country was originally expected to meet the convergence criteria which are the requirements of a nation's inflation rate, interest rate, budget deficits and government debt.
12. The crawling peg means a currency pegs its value to that of another currency, but allows it to fluctuate within certain limit.
13. A currency board is a monetary authority that issues domestic notes and coins convertible into a foreign anchor currency (the reserve currency) at a fixed rate and on demand.
14. Dollarization is an exchange rate arrangement allowing the currency of another nation to serve as legal tender. It helps the small countries to avoid the speculative attacks on the local currency and capital market. The small nations can achieve economic stability through dollarization.
15. The case for a floating exchange rate regime claims (i) such a system gives countries autonomy regarding their monetary and fiscal policy; (ii) floating exchange rates facilitate smooth adjustment of BOP imbalances and (iii) floating exchange rates are more conducive to economic stability.
16. The case for a fixed exchange rate regime claims (i) the need to maintain a fixed exchange rate imposes monetary discipline on a country, (ii) floating exchange rate regimes are vulnerable to speculative pressure, (iii) the uncertainty that accompanies floating exchange rates dampens the growth of international trade and investment, and (iv) keeping the exchange rates low can improve the competitiveness in foreign trade.

Key Terms

Anchor currency (锚货币)

Bretton Woods system (布雷顿森林体系)
Clean float (清洁浮动)
Commodity money (商品货币)
Commodity-backed money (商品支撑货币)
Convergence criteria (趋同标准)
Crawling pegs (爬行钉住)
Currency boards (货币局制度)
Currency baskets (货币篮制度)
Devaluation (法定贬值)
Dollarization (美元化)
Dollar crisis (美元危机)
Euro (欧元)
European currency unit (ECU) (欧洲货币单位)
European Economic and Monetary Union (EMU) (欧洲货币与经济联盟)
Exchange rate system (汇率制度)
Fiat money (法定通货)
Fixed exchange rate (固定汇率)
Floating exchange rate (浮动汇率)
General Agreement on Tariffs and Trade (GATT) (关税与贸易总协定)
Gold export point (黄金输出点)
Gold import point (黄金输入点)
Gold par value (Gold parity) (黄金平价)
Gold pool (黄金总库)
Gold standard (金本位)
Gold exchange standard (金汇兑本位)
International Bank for Reconstruction and Development (国际复兴与开发银行)
International Monetary Fund (IMF) (国际货币基金组织)
International monetary system (国际货币体系)
Jamaica Accord (牙买加协定)
Louvre Accord (卢浮协定)
Managed float (管理浮动)
Maastricht Treaty (马斯特里赫特条约)
Oil crisis (石油危机)

Par value (平价汇率,或中心汇率)
Parity band (平价波幅)
Pegged exchange rate (钉住汇率)
Plaza Agreement (广场协议)
Price-specie-flow mechanism (物价与现金流动机制)
Revaluation (法定升值)
Rule of the game (游戏规则)
Seigniorage (铸币税)
Smithsonian Agreement (史密森协议)
Special drawing rights (SDRs) (特别提款权)
Triffin dilemma (特里芬难题)
World Bank (世界银行)

Questions

1. Describe the gold standard. What forced the gold standard to collapse?
2. Explain the exchange rate determination under the gold standard.
3. Why were the exchange rates under the gold standard stable?
4. What are the pros and cons of the gold standard?
5. Explain the mechanism that restores the balance-of-payments equilibrium when it is disturbed under the gold standard.
6. Define the fixed exchange rate and floating exchange rate.
7. Describe the Bretton Woods system.
8. What factors contributed to the fall of Bretton Woods system?
9. Why did the Bretton Woods system break down according to Robert Triffin?
10. What are the advantages of fixed exchange rate and the floating exchange rate?
11. What are the main advantages for EMU countries to use euro?
12. List the pros and cons of the dollarization.
13. What is a currency board? What is the difference between a currency board and the dollarization?
14. What are the differences between a crawling peg system and a fixed rate system?
15. What does anchor currency mean? What is most actively used as an anchor currency nowadays?

CHAPTER 5
EXCHANGE RATE DETERMINATION AND FORECASTING EXCHANGE RATES

LEARNING OBJECTIVES

- Examine the simple model of exchange rate determination: the supply and demand of a currency determine the price of the currency
- Explore the purchasing power parity theory, i.e. how price levels and price level changes (inflation) in countries determine the exchange rate at which their currencies are traded
- Discover the relationship between the forward exchange rate and interest rate which is called interest rate parity (IRP)
- Distinguish between the covered and uncovered interest parity (UIP)
- Show how forward exchange rates reflect expectations held by market participants about the future spot exchange rate (Forward Parity)
- Analyze the relationship between interest rate and inflation rate (Fisher equation, International Fisher equation, Real interest parity)
- Understand the exchange rate forecasting techniques

It is critical that international businesses understand the influence of exchange rate on the profitability of trade and investment deals. As a firm that realizes more than half of its sales in profits in foreign currencies, Minnesota Mining & Manufacturing Co. (3M) is very sensitive to fluctuations in exchange rates. As the dollar appreciates against other currencies, 3M's profits decline; as the dollar depreciates, its profits increase. In 1998, the producer of Scotch Tape announced that the appreciating dollar had cost the firm \$330 million in profits and \$1.8 billion in revenue during the previous three years. In fact, it

is not unusual for international businesses to suffer losses because of unpredicted changes in exchange rates. Currency fluctuations can make seemingly profitable trade and investment deals unprofitable, and vice versa. Could the 3M Company avoid those losses beforehand? If the answer is yes then we should know how the exchange rate is determined and why exchange rates change over time. It is also important to understand how to forecast foreign exchange rates.

This chapter examines the determinants of the foreign exchange rate behavior and several key international parity conditions, such as purchasing power parity and interest rate parity, which have profound implications for international trade and investment. We first introduce a simple model to determine the exchange rate, i. e. how the demand and supply of a currency influence the price of that currency. We then discuss several international parity conditions which are all based on the law of price: the purchasing power parity, interest rate parity, uncovered interest parity and real interest parity, forward parity, Fisher equation and international Fisher equation. Finally, we explore basic techniques for the exchange rate forecasting.

A Simple Model for the Determination of the Foreign Exchange Rate

Now we are going to use an analytical model to describe the determination of the foreign exchange rate. We shall first assume two conditions in this framework.

1) No obstructions or controls on foreign exchange transactions.

2) No government interference for the exchange rate.

Those assumptions imply the relative countries adopt floating exchange rate system. Under these assumptions, market forces of supply and demand determine the exchange rates. Now we examine the demand side and supply side of the foreign exchanges.

The Demand for Foreign Exchange

Here, we use the euro as the foreign exchange in our analytical model. The demand for euros in the foreign exchange market results from transactions of goods, services, investment instruments, speculations, and hedging needs.

Therefore, the demand for euros in the foreign exchange market is a **derived demand**; that is, the euros are not demanded because they have an intrinsic value in themselves, but rather because of what they can buy. **Exhibit 5.1** shows the derivation of a hypothetical demand for euros schedule with respect to changes in the exchange rate. As the value of euro changes, quantity demanded for euros also changes. When the euro depreciates against the yen, say from ¥130/€ 1 towards ¥120/€ 1, the price of the German exports to Japanese importers decreases from ¥1,300 to ¥1,200, which leads to a higher quantity of German exports and an increased demand for euros (from € 12,000 to € 16,000). If the euro depreciates further to ¥110/€, the quantity demand for euros will increase to € 20,000. Hence, the demand curve ($D^€$) for euros which is depicted in the **Figure 5.1** slopes down from left to right.

Exhibit 5.1 The demand for euros schedule

Price of German export goods in € s	Exchange rate ¥/€	Price of German export goods in ¥s	Quantity of German exports	Demand for euros
10	¥110/€ 1	1,100	2,000	20,000
10	¥120/€ 1	1,200	1,600	16,000
10	¥130/€ 1	1,300	1,200	12,000

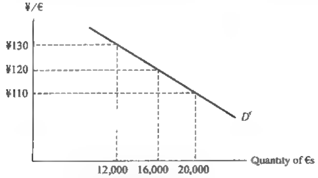

Figure 5.1 The demand curve for euros

In this simple model, the demand for euros depends upon the demand for German exports or the euro exchange rate. The lower euro exchange rate implies the lower price of German exports which leads to higher demand for

euros and vice versa. Any factor other than the euro exchange rate which results in an increase in the demand for euros will shift the original demand curve for euros to the right. Among factors that result in a rightward shift of the demand schedule for euros are a rise in Japanese income, a change in Japanese taste in favor of German goods, and a rise in the price of Japanese goods and so on.

For example, suppose that the price of German exports is €10 and the yen/euro exchange rate is ¥120/€. At this level, the quantity demanded for euros is €16,000. If Japan experiences high economic growth so that Japanese national income is up, the Japanese may purchase more German goods even though the exchange rate remains unchanged. Or, suppose that Japan has higher inflation than Germany. The Japanese may prefer to consume more German goods because of the relative lower prices. All these factors would result in an increased demand for German exports and hence euros. The effect of an increase in the demand for euros is to shift the demand schedule to the right.

The Supply of Foreign Exchange

In our model the supply of euros is in essence the German demand for Japanese yen. When the Germans buy Japanese goods, they need to sell euros for Japanese yen and thus the need constitutes the supply of euros in the foreign exchange market. **Exhibit 5.2** sets out the derivation of a hypothetical supply of euros schedule. As the euro appreciates, the cost of Japanese exports becomes lower for German residents. As such, they demand more Japanese exports and this results in an increased demand for yen purchased by increasing the amount of euros supplied in the foreign exchange market, and this yields an upward-sloping supply curve of euros ($S^€$) depicted in **Figure 5.2**.

Exhibit 5.2 The supply of euros schedule

Price of Japanese export good in yen	Exchange rate ¥/€	Price of Japanese export good in €s	Quantity of Japanese exports	Demand for yen	Supply of euros
1200	¥110/€1	10.91	1,000	1,200,000	10,910
1200	¥120/€1	10.00	1,600	1,920,000	16,000
1200	¥130/€1	9.23	2,200	2,640,000	20,308

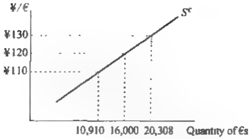

Figure 5. 2 The supply curve of euros

The supply of euros schedule ($S^€$) depends upon the German demand for Japanese exports. Like the demand curve, the supply curve will shift to the right if there is an increase in German income, a change in German tastes in favor of Japanese goods or a rise in German prices. All these factors imply an increased demand for Japanese goods and yen which is reflected in an increased supply of euros.

The Equilibrium Exchange Rate

Since the exchange market is merely a market which brings together those people that wish to buy a currency (which represents the demand) with those that wish to sell the currency (which represents the supply), then the spot exchange rate can most easily be thought of as being determined by the interaction of the supply and demand for the currency. **Figure 5. 3** illustrates the determination of the yen/euro exchange rate in the context of such a supply and demand framework. The figure depicts the supply and demand for euros in the foreign exchange market. The exchange rate is determined by the intersection of the supply and demand curves ($S^€$ and $D^€$) to yield a yen/euro exchange of ¥120/€1. This exchange rate is the **equilibrium exchange rate** at which the quantity demanded for the euros equals the quantity of the euros supplied (€16,000). When the exchange rate is left to float freely it is determined by the interaction of the supply and demand curves.

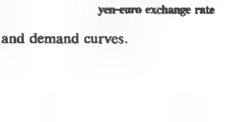

Figure 5. 3 Determination of the yen-euro exchange rate

A Change in Exchange Rate

As we discussed before, if, at a given exchange rate, there is an increase in the demand for German goods which shifts the demand curve from D_1 to D_2 as depicted in **Figure 5.4**, and this increase in the demand for euros leads to an appreciation of the euro from ¥120/€ to ¥130/€ 1. **Figure 5.5** examines the impact of an increase in the supply of euros due to an increased demand for Japanese exports and therefore Japanese yen. The increased supply of euros shifts the S_1 schedule to the right to S_2 resulting in a depreciation of the euro to ¥110/€ 1. The essence of a floating exchange rate is that the exchange rate adjusts in response to changes in the supply and demand for a currency. If quantity supplied of a currency exceeds quantity demanded for the currency, the value of the currency falls in the foreign exchange market and vice versa. In this simple model, we point out that the factor behind the demand for and supply of euros is German goods or Japanese goods. In the real world, there are many other factors that cause the supply and demand schedules of euros to change. These factors include market fundamentals and market expectations.

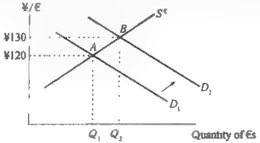

Figure 5.4 A change in demand (Increase in demand)

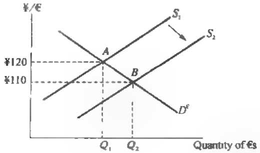

Figure 5.5 A change in supply (Increase in supply)

Market fundamentals refer to economic variables such as balance of payments, relative inflation rates and interest rates, national income and government economic policies, etc. **Market expectations** result from the news or events about the economic variables and very importantly, the speculative opinion about future exchange rates. It should be noted that these factors cause the supply and demand of a particular currency to change only in the medium- or long-run. In the short-run, foreign exchange transactions are dominated by transfers of bank deposits and other financial assets; such transactions have a major influence on day-to-day exchange rates. Therefore, it is not unusual that the movement of short-run exchange rate is sometimes inconsistent with that indicated by long-run economic variables.

Foreign Exchange Market Intervention

The exchange rate is not necessarily determined by the market forces of demand and supply even under the floating exchange regime. It seems that every country's central bank these days is involved in some sort of capital control over its currency. Besides standard monetary and fiscal strategies, these policies are used to keep the domestic currency under control and its keep a country's economic growth stable. One of the most frequently-used strategies by policy makers is direct market intervention. If the exchange rate changes frequently and violently, the governments would like to directly enter into the market to make up the difference between the supply and demand of the domestic currency. By intervening, the monetary authorities keep the exchange rate from changing and avoid the consequences of the unstable exchange rate. As an example, **Figure 5.6** depicts the process of foreign exchange market intervention.

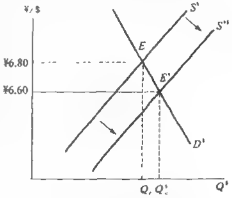

Figure 5.6 Intervention in the exchange markets

Suppose that the People's Bank of China thinks the appropriate RMB/dollar rate should be ¥6.60/$. If the present market rate is ¥6.80/$, the central bank will sell the dollar (or buy dollar-

denominated assets) and buy yuan, thus increasing the supply of the US dollar from Q_e to Q'_e. The original supply schedule now shifts rightward to point E'. The central bank stops intervening in the market because the exchange rate falls to 6.60 ¥/\$.

Purchasing Power Parity (PPP)

In the previous section we explained that the exchange rate is set and changes according to the market forces. If we understand how exchange rates are determined, we may be able to forecast exchange rate movements. Because future exchange rate movements influence export opportunities, the profitability of international trade and investment deals, and the price competitiveness of foreign imports, this is valuable information for an international business. Unfortunately, there is no simple explanation. The forces that determine exchange rates are complex, and no theoretical consensus exists, even among academic economists who study the phenomenon every day. Nonetheless, most economic theories of exchange rate movements seem to agree that three factors have an important impact on future exchange rate movements in a country's currency: the country's price inflation, its interest rate, and market psychology. In this section we look at one of the earliest and simplest models of exchange rate determination known as purchasing power parity (PPP) theory. PPP theory has been advocated as a satisfactory model of exchange rate determination in its own right, and also provides a point of reference for the long-run exchange rate in many of the modern exchange rate theories.

The Law of One Price

PPP theory is generally attributed to the Swedish economist Gustav Cassel's writings in the 1920s. This theory is based on the law of one price.

The **law of one price** states that identical products that are easily and freely traded in a perfectly competitive global market (free of transportation costs and barriers to trade) should have the same price everywhere, once the prices at different places are expressed in the same currency.

$$P^d = S^{d/f} \cdot P^f \tag{5.1}$$

where

P^d: the domestic price

P^f: the foreign price

$S^{d/f}$: the amount of domestic currencies per unit of foreign currency (exchange rate)

If the same commodities have different prices in different places, people will begin to take advantage of it by buying commodities in the cheaper market and then shipping them to and selling them in the more expensive market. People who buy in one market and sell in another are **commodity arbitragers**.

For example, if a pair of Nike sneakers retails for \$80 in New York and sells for HK\$640 in Hong Kong, the exchange rate between the U.S. dollar and the Hong Kong dollar should be U.S. \$1 = HK\$8 (HK\$640/US\$80) according to PPP. Consider what would happen if a pair costs HK\$600 in Hong Kong (\$75 in U.S. currency). At this price, it would pay for a trader to buy sneakers in Hong Kong and sell them in New York (an example of commodity arbitrage). The company initially could make a profit of \$5 on each pair by purchasing it for HK\$600 (US\$75) in Hong Kong and selling it for \$80 in New York (we are assuming away transportation costs and trade barriers). However, the increased demand for sneakers in Hong Kong would raise their price in Hong Kong, and the increased supply of sneakers in New York would lower their price there. This would continue until prices were equalized. Thus, prices might equalize when a pair of sneakers costs HK\$624 in Hong Kong and US\$78 in New York (assuming no change in the exchange rate of \$1 = HK\$8).

The proponents of PPP argue that the exchange rate must adjust to ensure that the law of one price which applies only to individual goods also holds international for identical bundles of goods.

Absolute Purchasing Power Parity

Purchasing Power refers to the amount of real goods and services each unit of money will buy. It is the reciprocal of price index. **Price index** is an index number of the prices of goods of some given type. If only one commodity i is concerned, period 0 is the base period, and period t the current period. The price index is given by P_{it}/P_{i0}. If a class of goods $i - 1, 2, 3 \cdots N$ is concerned, the price index is a weighted average of the indices of their prices. The weights

are the values of the goods purchased in some period.

$$P_C = (\sum_i P_{it} q_{it}) / (\sum_i P_{i0} q_{i0})$$

PPP describes the relation between average price levels in each country and the equilibrium exchange rate. If the law of one price were true for all goods and services, the purchasing power parity exchange rate could be found from any individual set of prices. By comparing the prices of identical products in different currencies, it would be possible to determine the "real" or PPP exchange rate that would exist if markets were efficient. (An **efficient market** has no impediments to the free flow of goods and services, such as trade barriers.)

We can formalize and express absolute PPP as **Equation (5.2)**. Let $S^{d/f}$ denote the spot exchange rate; P^d the domestic price level and P^f the foreign price level. Then the absolute PPP is expressed as:

$$S^{d/f} = P^d / P^f \tag{5.2}$$

Thus, if a basket of goods costs \$200 in the United States and ¥20,000 in Japan, PPP theory predicts that the yen/dollar exchange rate should be 20,000/200 or ¥100 per U.S. dollar (or \$0.01 = ¥1).

Every year, the newsmagazine *The Economist* publishes its own version of the PPP theorem, which it refers to as the "Big Mac Index". The *Economist* has selected McDonald's Big Mac as a proxy of a "basket of goods" because it is produced according to more or less the same recipe in about 120 countries. The Big Mac PPP is the exchange rate that would have hamburgers costing the same in each country. According to *The Economist*, comparing a country's actual exchange rate with the one predicted by the PPP theorem based on relative prices of Big Macs is a test on whether a currency is undervalued or not. This is not a totally serious exercise, as *The Economist* admits, but it does provide us with a useful illustration of the PPP theorem.

The Big Mac index for July 2010 is reproduced in **Exhibit 5.3**. To calculate the index *The Economist* converts the price of a Big Mac in a country into dollars at current exchange rates and divides that by the average price of a Big Mac in America (which is \$3.73). According to the PPP theorem, the prices should be the same. If they are not, it implies that the currency is either overvalued against the dollar or undervalued. An **overvalued currency** is a currency in which the actual market-determined value is higher than the value

predicted by an economic theory or model. An **undervalued currency**, on the other hand, is a currency in which the actual market-determined value is lower than that predicted by an economic theory or model. For example, as **Exhibit 5.3** shows, the average price of a Big Mac in China was ¥13.20 in 2010. Dividing this by the average price of a Big Mac in the United States gives ¥3.5389/$ (i.e. 13.20/3.73), which is the implied PPP of the dollar (the fourth column in **Exhibit 5.3**). But on July 21, 2010, the actual dollar exchange rate was ¥6.78/$ (the fifth column), and it suggests that the actual dollar value was overvalued against the yuan or the yuan was undervalued against the dollar. The degree to which the U.S. dollar was overvalued versus the yuan is calculated by the following formula:

Exhibit 5.3 The Big Mac index

Country (region)	Big Mac prices		Implied PPP♀ of the dollar	Actual dollar exchange rate July 21*	Under(−)/over(+) valuation against the dollar, %
	in local currency	in dollars			
United States	$ 3.73	3.73			
Argentina	Peso 14.0	3.56	3.75	3.93	−5
Australia	A$ 4.35	3.84	1.17	1.13	3
Brazil	Real 8.71	4.91	2.33	1.77	31
Canada	C$ 4.17	4.00	1.12	1.04	7
Chile	Peso 1,750	3.34	469	524	−10
China	Yuan 13.2	1.95	3.54	6.78	−48
Colombia	Peso 8,200	4.39	2,196	1,868	18
Costa Rica	Colones 2,000	3.83	536	522	3
Czech Rep.	Koruna 67.6	3.43	18.1	19.7	−8
Denmark	DK 28.5	4.90	7.63	5.81	31
Egypt	Pound 13.0	2.28	3.48	5.70	39
Estonia	Kroon 32.0	2.62	8.57	12.2	−30
Euro area☆	€3.38	4.33	1.10‡	1.28‡	16
Hong Kong	HK$ 14.8	1.90	3.96	7.77	−49
Hungary	Forint 740	3.33	198	222	−11
Indonesia	Rupiah 22,780	2.51	6,102	9,063	33

Continued

Country (region)	Big Mac prices		Implied PPP♀ of the dollar	Actual dollar exchange rate July 21st	Under(−)/over(+) valuation against the dollar, %
	in local currency	in dollars			
Israel	Shekel 14.9	3.86	3.99	3.86	3
Japan	¥320	3.67	85.7	87.2	−2
Latvia	Lats 1.55	2.80	0.42	0.55	−25
Lithuania	Litas 7.30	2.71	1.96	2.69	−27
Malaysia	Ringgit 7.05	2.19	1.89	3.21	−41
Mexico	Peso 32.0	2.50	8.57	12.8	33
New Zealand	NZ$ 5.00	3.59	1.34	1.39	−4
Norway	Kroner 45.0	7.20	12.1	6.25	93
Pakistan	Rupee 210	2.46	56.3	85.5	−34
Peru	Sol 10.0	3.54	2.68	2.83	−5
Philippines	Peso 32.0	2.19	27.3	46.5	−41
Poland	Zloty 8.30	2.60	2.22	3.20	−30
Russia	Ruble 71.0	2.33	19.0	30.4	−38
Saudi Arabia	Riyal 10.0	2.67	2.68	3.75	−29
Singapore	S$ 4.23	3.08	1.13	1.37	−18
South Africa	Rand 18.5	2.45	4.94	7.54	−34
South Korea	Won 3,400	2.82	911	1,204	−24
Sri Lanka	Rupee 210	1.86	56.3	113	−50
Sweden	SKr 48.4	6.56	13.0	7.37	76
Switzerland	SFr 6.50	6.19	1.74	1.05	66
China Taiwan	NT$75.0	2.34	20.1	32.1	−37
Thailand	Baht 70.0	2.17	18.8	32.3	−42
Turkey	Lira 5.95	3.89	1.59	1.53	4
UAE	Dirham 11.0	2.99	2.95	3.67	−20
U.K	£2.29	3.48	1.63★	1.52★	7
Ukraine	Hryvnia 14.5	1.84	3.88	7.90	−51
Uruguay	Peso 79.0	3.74	21.2	21.1	nil

♀: Implied PPP (purchasing power parity) — local price/price in the United States

⚦: Weighted average of prices in euro area

‡ Dollars per euro

★: Dollars per pound

Source: "The Big Mac Index" ***The Economist***, July 22nd 2010

$$\frac{\text{Actual exchange rate} - \text{Implied exchange rate}}{\text{Implied exchange rate}} \tag{5.3}$$

Therefore, the dollar was overvalued by:

(¥6.78/\$ ¥3.54/\$)/¥3.54/\$ = 0.9153 = 91.53%

To calculate the undervaluation of the yuan we have two ways. First we can use the reciprocal of the above given exchange rate and then apply **Equation 5.3**:

(1/6.78−1/3.54) /(1/3.54) =−48%

Second, the undervaluation of the yuan can be calculated by applying the **Equation 5.4** which is:

$$\frac{\text{Implied exchange rate} - \text{Actual exchange rate}}{\text{Actual exchange rate}} \tag{5.4}$$

So, the yuan was undervalued by

= (¥3.54/\$ −¥6.78/\$)/¥6.78/\$ =−48%

This is the value in the last column of **Exhibit 5.3**. The 2010 index shows Asia remains the cheapest place to enjoy a burger. China's yuan is still undervalued even China has agreed to give yuan more "flexibility".

The Big Mac Index may be a good candidate for the application of the law of one price and measurement of under- or overvaluation. But as *The Economist* points out, the Big Mac Index is not perfect.

*The index was never intended to be a precise predictor of currency movements, simply a take-away guide to whether currencies are at their "correct" long-run level. Curiously, however, burgernomics has an impressive record in predicting, exchange rates: currencies that show up as overvalued often tend to weaken in later years. But you must always remember the Big Mac's limitations. Burgers cannot sensibly be traded across borders and prices are distorted by differences in taxes and the cost of non-tradable inputs, such as rents.*①

Relative Purchasing Power Parity

The next step in the PPP theory is to argue that the exchange rate will change if relative prices change. The change in exchange rate should be equal to

① "Happy 20th Anniversary", ***The Economist***, May 25, 2006

the difference in prices change between the two economies. For example, imagine there is no price inflation in the United States, while prices in Japan are increasing by 10 percent a year. At the beginning of the year, a basket of goods costs \$200 in the United States and ¥20,000 in Japan, so the yen/dollar exchange rate, according to PPP theory, should be \$1 = ¥100. At the end of the year, the basket of goods still costs \$200 in the United States, but it costs ¥22,000 in Japan. Relative PPP theory predicts that the exchange rate should change as a result. More precisely, by the end of the year:

$$St^{¥/\$} = ¥22{,}000/\$200$$

Thus, \$1 = ¥110. Because of 10 percent price inflation in Japan, the dollar has appreciated against the yen by 10 percent. One dollar will buy 10 percent more yen at the end of the year than at the beginning.

Figure 5.7 shows the relationship between the exchange rate and price level in the related countries (the **relative purchasing power parity** theory). The purchasing power parity line (PPP line) is a 45 degree line. It shows that the percent change in the spot exchange rate for foreign currency should be equal to the percent difference in expected inflation rate if the relative PPP holds. For instance, if the inflation rate of the foreign currency (π^f) is lower than the domestic inflation rate (π^d) by 3%, the value of the foreign currency will increase by 3% compared to the domestic currency (point P in the figure). Therefore,

$$\% \Delta S = \pi^d - \pi^f \tag{5.5}$$

Equation (5.5) provides a hint about exchange rate trends in the long run. That is: Currencies with relatively low inflation rates tend to appreciate in the foreign exchange market; while currencies with relatively high inflation rates tend to depreciate in the foreign exchange market.

The theory of relative purchasing power parity can be used to predict long-run exchange rates. Consider the following example. If the CPI for the U.S. in 2000 was 111.4, and 121.2 in 2004, in U.K. the CPI was 112.8 and 123.1 respectively, and if the respective exchange rate was 1.639 \$/£ and 1.871 \$/£ in 2000 and 2004, was the pound correctly priced in 2004 according to relative PPP?

To predict the 2004 dollar/pound exchange rate we first calculate the

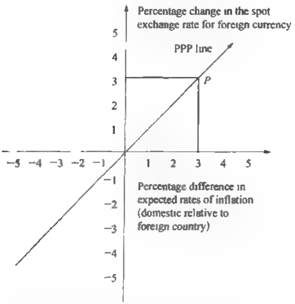

Figure 5.7 Relative purchasing power parity

inflation rate of both the U. S. and the U. K. The U. S. inflation rate in this period is 8.8% [(121.2/111.4) − 1]. The U. K. inflation rate at the same period is 9.13% [(123.1/112.8) − 1]. Second, we calculate the inflation rate differential. The U. K. inflation is 0.33% (9.13% − 8.8%) higher than the U. S. inflation. The pound should depreciate against the dollar by 0.33% according to **Equation (5.5)**. Therefore, the implied exchange rate between the dollar and the pound is:

$$\$1.639/£\ (1-0.33\%) = \$1.634/£$$

The result shows the pound was overvalued. The actual pound value was \$1.871, and the implied value should be \$1.634. So the pound was overvalued against the dollar according to **Equation (5.3)** by:

$$(1.871-1.634)/1.634 = 14.5\%$$

The relative purchasing power parity can also be expressed by the following formula:

$$S_1/S_0 = (P^d/P^f)_1/(P^d/P^f)_0 \qquad (5.6)$$

Or,

$$S_1 = S_0 \cdot [(P^d/P^f)_1/(P^d/P^f)_0] \qquad (5.7)$$

Or, $$S_1 = S_0 \cdot [(P_1^d/P_0^d) / (P_1^f/P_0^f)] \tag{5.8}$$

Where

S_0: the exchange rate in base period

S_1: the exchange rate in period 1

P^d: is the domestic price index

P^f: the foreign price index

The previous question can be solved by applying **Equation (5.8)**:

$$\begin{aligned} S_{2004} &= S_{2000} \cdot [(P_{2004}{}^{US}/P_{2000}{}^{U.S}) / (P_{2004}{}^{UK}/P_{2000}{}^{UK})] \\ &= 1.639\ (\$/£) \cdot [(121.2/111.4) / (123.1/112.8)] \\ &= 1.639\ (\$/£) \cdot (1.0880/1.0913) \\ &= 1.6340(\$/£) \end{aligned}$$

This is the implied exchange rate predicted by the relative PPP theory which is the same as our previous answer.

Problems of PPP

Is PPP theory true in practice? Extensive empirical testing of PPP theory has yielded mixed results. While PPP theory seems to yield relatively accurate predictions in the long run, it does not appear to be a strong predictor of short-run movements in exchange rates covering time spans of five years or less. As a matter of fact, there are noticeable deviations from PPP in the short run. In addition, the theory seems to best predict exchange rate changes for countries with high rates of inflation and underdeveloped capital markets. The theory is less useful for predicting short-run exchange rate movements between the currencies of advanced industrialized nations that have relatively small differentials in inflation rates. The failure of PPP theory to predict exchange rates more accurately can be summarized as follows:

Transportation costs and trade barriers are significant and they tend to create significant price differentials between countries. So prices are allowed to differ between markets by up to the cost of transportation.

Restrictions on movement of goods (trade barrier) like **import tariffs** can also cause PPP violations. If a country has 15% import tariff, prices within the country will have to move more than 15% above those in the other countries.

Quotas, which are limits on the amounts of different commodities that can be imported, generally mean that price differences can become quite sizable, because commodity arbitrages are limited in their ability to narrow the gaps.

Price discrimination still exists because of imperfect competition. Dominant enterprises may be able to exercise a degree of pricing power, setting different prices in different markets to reflect varying demand conditions. In this case, arbitrage must be limited. Enterprises with some marketing power may be able to control distribution channels and therefore limit the unauthorized resale (arbitrage) by differentiating otherwise identical products among nations along some line, such as design or packaging.

For example, even though the version of Microsoft Office sold in China may be less expensive than the version sold in the United States, the use of arbitrage to equalize prices may be limited because few Americans would want a version that was based on Chinese characters. The design differentiation between Microsoft Office for China and for the United States means that the law of one price would not work for Microsoft Office, even if transportation costs were trivial and tariff barriers between the United States and China did not exist.

Price indices are different in different countries. Many of the items that are included in the commonly used price indices do not enter into international trade. Some of the items are immovable or inseparable from the providers of their services, such as real estates, haircuts, medical services, housing, and the like. Therefore, one of the major problems is to decide whether or not the PPP theory is supposed to be applicable to both traded goods and non-traded goods, or applicable to only one of those categories. The wholesale price indices are normally dominated by traded goods, while the consumer price indices generally include both traded and non-traded goods. Whichever price index is employed, an overall problem is that PPP is only expected to hold for similar baskets of goods, but national price indices typically attach different weights to different classes of goods. Some goods and services are more important for some countries than for other countries. PPP requires that the goods and services in the price indices should have the same weight. It is unrealistic.

Even if PPP does not hold in most cases, it is still popular among academic studies and even among decision makers. The PPP theory at least provides us

with currencies' long-run tendency in the foreign exchange market. In some cases, it is also useful in economic analysis. As we have learned from the Big Mac Index, one can use the implied exchange rate by PPP as a benchmark in deciding if a country's currency is undervalued or overvalued against other currencies.

The Relationship of Forward Rate and Interest Rate

- ***Interest Rate Parity (IRP)***

Interest rate parity as a theory was first developed by J. M. Keynes in 1930. The theory relates interest rate to forward exchange rate. Like purchasing power parity, interest rate parity is based on the law of one price. However, where PPP refers to the law of one price in the commodity market, interest rate parity refers to the law of one price in the securities market. When quoted in a common currency, identical securities should have the same yields in all financial markets.

Interest rate parity, or **IRP**, states that the forward discount or premium between two currencies is determined by the nominal interest rate differential between those currencies. **Figure 5.8** illustrates the relationship of the forward exchange rate and the interest rates between the two countries.

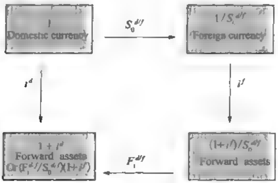

Figure 5.8 Relationship of the forward exchange rate and the interest rate

Consider one unit of domestic currency that can be invested both in the

domestic and foreign financial market. Suppose the domestic annual interest rate is i^d and the foreign annual interest rate is i^f. When one unit of the domestic currency is invested in the domestic financial market, it will become $(1+i^d)$ at the end of the year. If one unit of the domestic currency is invested in the foreign market, it should first be converted into the foreign currency $(1/S^{d/f})$. It will become $(1/S^{d/f})\ (1+i^f)$ at the end of the year, since the foreign interest rate is i^f. However, when you move from the domestic currency into foreign currency the investment in foreign financial market is not identical to the domestic investment because the exchange rate could change over the year of the investment. This means that you are exposed to exchange risk. A change in the value of the domestic currency versus the foreign currency would change the number of domestic currency you receive when you convert your foreign currency investment into domestic currency at the end of the investment. A depreciation of the foreign currency would reduce the number of domestic currency you receive, while an appreciation of the foreign currency would increase it. In order to render the two investments identical, the exchange risk must be eliminated. This can be done by making a deal to sell the proceeds of the foreign currency investment in the forward market. With the forward transaction the two investments are comparable and the return in the domestic currency on the foreign currency investment can effectively be calculated.

According to the law of one price, the return should be equal no matter where you invest your domestic currency. If the expected returns on two similar financial instruments are different, one will move one instrument to another. In equilibrium, these rates would be equal. That is, we would have interest parity, in which interest rate equalization across nations would ensure that no such flow of funds would occur. Therefore, $(1+i^d) = (1+i^f)\ F^{d/f}/S^{d/f}$. Rearranging the equation, we get:

$$(1+i^d)\ /\ (1+i^f) = F^{d/f}/S^{d/f} \qquad (5.9)$$

This is the interest rate parity. The left side of the equation is the interest rate differential between the domestic and foreign financial instruments; and the right side is the forward premium or discount.

There is a simplified version of the IRP. For the right part of the **Equation (5.9)**, we use the fact that

$$F^{d/f}/S^{d/f} \quad (S^{d/f}/S^{d/f}) + (F^{d/f} - S^{d/f})/\ S^{d/f} = 1 + (F^{d/f} - S^{d/f})/\ S^{d/f}$$

to rewrite the parity condition as

$$1+i^d=[1+(F^{d/f}-S^{d/f})/\,S^{d/f}]\,(1+i^f).$$

Cross-multiplying the right part of the equation yields:

$$1+i^d=1+(F^{d/f}-S^{d/f})/\,S^{d/f}+i^f+i^f[(F^{d/f}-S^{d/f})/\,S^{d/f}]$$

Because i^f and $(F^{d/f}-S^{d/f})/S^{d/f}$ are both typically small fractions, their product is approximately equal to zero. Making this approximation and subtracting 1 and i^f from both sides of the equation yields

$$(i^d-i^f)\approx(F^{d/f}-S^{d/f})\,/\,S^{d/f} \tag{5.10}$$

Equation (5.10) is also called covered interest parity condition. Covered interest parity states that the difference between the domestic interest rate and the foreign interest rate on a similar financial asset should approximately equal the forward premium or discount in percentage term.

In chapter 3 we discussed the forward exchange rate. **Exhibit 5.4** shows how the calculation of the forward premium or discount works in practice using the dollar-sterling exchange rate and data from the *Financial Times*. It should be noted when the one-month forward premium or discount is calculated, the annual interest rate should be divided by 12 so that the maturity of the interest rate is consistent with that of the forward premium or discount. By the same token, the annual interest rate should be divided by 4 to calculate the 3-month forward premium or discount.

Exhibit 5.4 \$/£ forward exchange quotations and U.K. and US interest rates

	Dollar-pound exchange rate	Sterling interest rate	Dollar interest rate
Spot rate	1.8277	%	%
1-month	1.8228	4.8125	1.59375
3-month	1.8132	4.9375	1.71875
6-month	1.7998	5.0625	1.93750
12-month	1.7761	5.2500	2.28125

Source: *Financial Times*, 12 August 2004

Notes:

The spot sterling exchange rate is 1.8277 dollars per pound.

The one-month forward exchange rate is calculated as:

$$F^{\$/£} - 1.8277 \times [(1+0.0159375/12) / (1+0.048125/12)]$$
$$= 1.8228$$

The three-month forward exchange rate is calculated as:

$$F^{\$/£} = 1.8277 \times [(1+0.0171875/4) / (1+0.049375/4)]$$
$$= 1.8132$$

The six-month forward exchange rate is calculated as:

$$F^{\$/£} = 1.8277 \times [(1+0.019375/2) / (1+0.050625/2)]$$
$$= 1.7998$$

The one-year forward exchange rate is calculated as:

$$F^{\$/£} = 1.8277 \times [(1+0.0228125) / (1+0.0525)]$$
$$= 1.7761$$

Covered Interest Arbitrage

To understand why IRP must be used to calculate the forward exchange rate, consider what would happen if the forward rate was different to that calculated in the example; say it was 1.7861 instead of 1.7761 of the one-year forward dollar/sterling rate. In this instance, a U.S. investor with \$100 could earn the U.S. interest rate and at the end of the year has \$102.28, but buying pounds spot (at \$1.8277/£) and simultaneously selling pounds forward (at \$1.7861/£) he would have £54.71 earning the U.K. interest rate of 5.25% giving him £57.58 (£54.71×1.0525) at the end of one year, which he would sell at a forward price of \$1.7861/£ giving \$102.85. Clearly, it pays for a U.S. investor to sell pounds forward. With a sufficient number of investors doing this, the forward rate of the pound would depreciate until such arbitrage possibilities were eliminated. With a spot rate of \$1.8277/£, only if the forward rate is at \$1.7761/£ will the guaranteed yields in U.S. and U.K. time deposits be identical, since £57.58 times 1.7761 equals \$102.27. Only at this forward exchange rate are there no riskless arbitrage profits to be made.

Figure 5.9 shows the covered interest rate parity. The vertical axis denotes the interest rate differential ($i^d - i^f$), and the horizontal axis represents the forward premium or discount $[(F^{d/f} - S^{d/f}) / S^{d/f}]$. The IRP line is a 45° line.

Any point on the IRP line indicates the covered interest parity condition is satisfied. In other words, no-arbitrage condition exists. There is no way arbitragers can make riskless arbitrage profits since the market is in equilibrium. Any point above or below the IRP line means interest rate differential is greater or less than forward premium or discount. In this case, there is arbitrage opportunity. Arbitragers can borrow money from one place and invest in another place to make no-investment, no-risk profits.

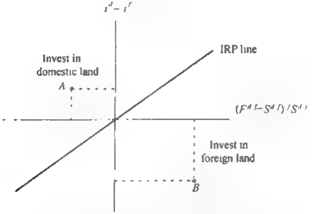

Figure 5.9 Covered interest rate parity

We face the same problem here as in triangular arbitrage. When the interest rate differential is not equal to the forward premium or discount, we know there is arbitrage opportunity. But which currency do we borrow and which currency do we lend in order to take advantage of the market disequilibrium? It should be made clear that the foreign currency here refers to the currency in the place of the denominator of the given exchange rate. The domestic currency is the currency in the place of the numerator of the given exchange rate. For instance, if the given exchange rate is $S^{¥/\$}$, the dollar is foreign currency and the U. S. is foreign country whereas the yen is domestic currency and Japan is domestic country. Here is the rule of thumb for covered interest arbitrage:

- If the intersection of interest rate differential and forward premium or discount lies above the IRP line (point A in the figure), borrow money from foreign land, exchange borrowed money for domestic currency in the spot market, invest the borrowed money in domestic land, and sell the domestic currency for foreign currency in the forward market.

- If the intersection of interest rate differential and forward premium or discount lies below the IRP line (point B in the figure), borrow money from domestic land, exchange borrowed money for foreign currency in the spot market, invest the money in foreign land, and finally sell the foreign currency for domestic currency in the forward market.

The following example shows when the covered interest parity does not hold, arbitrage opportunity will occur. Therefore, **covered interest arbitrage** refers to the activity of foreign exchange transaction resulting from the difference of the interest rates between two places, where the arbitragers move funds from one place to another place and at the same time buy and sell foreign exchange in the foreign exchange market.

Suppose that Korean won/U. S. dollar spot exchange rate is W1,200/\$, forward rate is W1,165/\$; The interest rate on U.S. government securities with one-year maturity is 7% and the interest rate on Korean government securities with one-year maturity is 5%, where should you invest and how much can you make from the covered interest arbitrage (ignoring the transaction fees)?

Since $i^{SK}-i^{US}=5\%-7\%=-2\%$

$$(F^{\$/£}-S^{\$/£})/S^{\$/£}=(1,165-1,200)/1,200=-2.92\%,$$

you should move funds from U. S. to Korea (interest rate differential < exchange rate differential). Covered interest arbitrage proceeds as follows:

1) Borrow \$1 million from the U.S. capital market for one year, your obligation will be \$1m×(1+7%) = \$1.07m.

2) Exchange dollars for won in the spot exchange market. This leaves you with a won inflow today which is \$1m×1,200 = W1,200m.

3) Invest the won in Korean government securities for one year. Your payoff at the end of the investment will be: W1,200m×(1+5%) = W1,260m.

4) Sell the expected W1,260m in the forward market. Your U.S. dollar inflow will be 1,260/1,165 = \$1.0815m.

Now you have \$1.07 million obligation and dollar net inflow of \$1.0815 at the end of the year. Your net profit is the difference of the two.

Net profit: \$1.0815m − \$1.07m = \$0.0115m = \$11,500 (ignoring transaction fees).

The above arbitrage will quickly affect both the financial market and foreign exchange market. In U.S. the demand for dollar goes up, it will raise

the U.S. interest rate; in Korea, the supply of won rises, it pushes down the interest rate of the won. See **Figure 5.10**. At the same time, in the spot market, the won is going to appreciate against the dollar since the demand for won increases; the dollar will lose its value because of the increased supply. In the forward market, the increased demand for the U.S. dollar forces up the value of the dollar. The value of Korean won will be pushed down because of the increased supply. It is illustrated in the **Figure 5.11**. Both the capital market and foreign exchange market will adjust until the covered interest parity holds.

Foreign exchange traders will tell you that interest rate differentials determine the forward premium and not vice versa. Forward rates are almost entirely an interest rate play. If there is disequilibrium, exchange rates are much more likely to change than the interest rates.

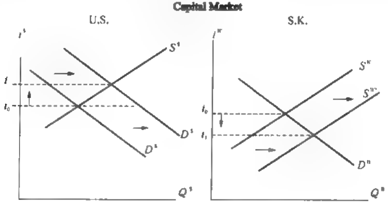

Figure 5.10 The financial market in U.S. and South Korea

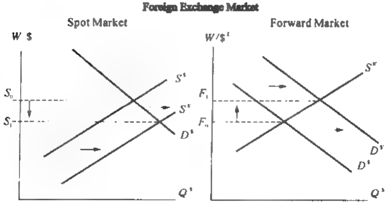

Figure 5.11 The spot and forward market for the U.S. dollar

Uncovered Interest Parity (UIP)

Sometimes people don't want to hedge the potential risks. There are a number of reasons why someone might choose not to use a forward exchange contract to hedge risk. For example, it might be that the transaction is not large enough to warrant a forward contract, which typically has a denomination of at least $1 million. In this situation, the individual might choose not to hedge the transaction at all, or might decide to use some other hedging instruments. Uncovered interest parity is based on the forward parity.

Forward parity states that the forward exchange rates are unbiased predictors of future spot rates. That is,

$$E\left[S_t^{d/f}\right] = F^{d/f} \tag{5.11}$$

When the forward rate is termed an "unbiased predictor of the future spot rate", it means that the forward rate over-or underestimates the future spot rate with relatively equal frequency and amount. That is to say, the distribution of possible actual spot rates in the future is centered on the forward rate. Therefore, the unbiased predictor does not mean that the future spot rate will actually be equal to what the forward rate predicts. The forward rate may, in fact, never actually equal the future spot rate.

Speculation will make the forward exchange rate approximately equal to the expected future spot rate. For example, if $E\left[S_t^{d/f}\right] > F^{d/f}$, speculators will buy foreign currency forward. This will force up the forward rate, $F^{d/f}$, until it is no longer less than the expected future spot rate. Similarly, if $E\left[S_t^{d/f}\right] < F^{d/f}$, speculators will sell forward foreign currency. This pushes the forward rate down until it is no longer more than the expected future spot rate. Only when the above equation holds is the forward rate in equilibrium in the sense that speculative pressures are not forcing the forward rate higher or lower.

But empirical studies show the forward rates are not good predictors of future spot rates over short forecasting period.

Uncovered interest parity states that nominal interest rates reflect expected changes in exchange rates, and vice versa. Since interest rates are tied to the forward premium or discount and the forward premium or discount is a predictor of change in the spot rate, then

$$(1+i^d)\ /\ (1+i^f) = E\left[S_t^{d/f}\right]\ /\ S_0^{d/f}, \tag{5.12}$$

Or, $$(i^d - i^f) \approx (E[S_t^{d/f}] - S_0^{d/f}) / S_0^{d/f} \tag{5.13}$$

For example, if the annual interest rate in U. S. is 5% while the annual interest rate in Japan is 3%, then on average the dollar is expected to depreciate by 2% per annum.

The uncovered interest arbitrage resembles the covered interest arbitrage except that the uncovered interest arbitrage does not take advantage of the forward market; so it involves more risks than covered interest arbitrage. If arbitragers' expectations are right, they can make money. Otherwise, they will lose money.

If a nation's currency value is highly variable, it is more difficult to predict its future value. If this is the case, individuals will become less confident in their ability to accurately predict the future spot rate. This makes the purchase of a foreign financial instrument a much riskier proposition. To induce investors to purchase a risky financial instrument, borrowers may have to offer a higher rate of return on the debt instruments they issue. In other words, the investors may require the risk premium for the more risky financial instruments. This means that in the above equation the risk premium should be added to compensate individuals for the additional risk they undertake. That is:

$$(i^d - i^f) + \approx (E[S_t^{d/f}] - S_0^{d/f}) / S_0^{d/f} + rp \tag{5.14}$$

where rp is the risk premium.

The risk premium can also reflect risks other than foreign exchange risk. The most common risk of those non-foreign-exchange-risks is the **country risk**, which is the risk due to the political and fiscal environment of the nation itself. A government with a considerable amount of external debt may eventually default on that debt, so holding its bonds is a risky proposition. Investors would risk losing the return on their funds, and perhaps their principal as well. Changes in government leadership may lead to increased taxes on foreign investment or restricted outflows of foreign funds. Hence, risk premium may reflect both foreign exchange risk and country risk.

For example, assume the spot exchange rate of Mexican peso versus dollar is Mex \$12/\$. The interest rate on one-year Mexican government bonds is 8.2% and the interest rate on U. S. treasury bonds with the same maturity is 7.5%. The international investors may require the risk premium because of the

country risk if investing in Mexico. Suppose the required risk premium is 2%, then the expected future spot rate must be:

$$E[S_t^{d/f}] \approx 12 \times [(8.2\% - 7.5\%) - 2\%] + 12 \approx \text{Mex}\$\ 11.844/\$$$

Real Interest Rates and Real Interest Parity

The Fisher Equation

When setting required returns, investors demand a return to compensate them for risk. They also try to anticipate future inflation. The Fisher equation, named after economist Irving Fisher, relates nominal interest rates (i) to real interest rates (r) and inflation rates (π).

$$(1+i) = (1+r)(1+\pi) \qquad (5.15)$$

If investors care about real (or inflation-adjusted) returns, then they will set nominal required returns to compensate them for their real required return and expected inflation. For example, if inflation in a particular country is expected to be 10 percent and investors require a real return of 3 percent on a 1-year government security, then the nominal required return on the government security should be:

$$i = (1+r)(1+\pi) - 1 = (1.03)(1.10) - 1 = 0.133, \text{ or } 13.3\%.$$

Realized real return is determined by the realized nominal return and inflation. If a bond yields 7% in a particular year and realized inflation is 5 percent, then the realized real return is:

$$r = [(1+i)/(1+\pi)] - 1 = (1.07/1.05) - 1 \approx 0.019, \text{ or } 1.9\%.$$

The Fisher equation can alternatively be written as

$$i = (1+r)(1+\pi) - 1 = r + \pi + r\pi. \qquad (5.16)$$

If real interest rates and inflation rates are low, then the cross-product term $r\pi$ is small and

$$i \approx r + \pi \qquad (5.17)$$

In the example, with $r = 0.019$, and $\pi = 0.05$, the nominal required return $i \approx 0.019 + 0.05 = 6.9\%$, which is close to the exact answer of 7.0%.

The International Fisher Equation

When Fisher equation is applied to international environment, it is the international Fisher equation or Fisher open. We know interest rate parity includes the ratio $(1+i^d)/(1+i^f)$. From the Fisher equation, each of the nominal interest rate compensates for a required real return r and expected inflation $E[\pi]$. The interest rate differential of the two countries is expressed by $(1+i^d)/(1+i^f)$. Substituting the Fisher equation in the numerator and denominator leads to

$$(1+i^d)/(1+i^f)=[(1+r^d)(1+E[\pi^d])]/[(1+r^f)(1+E[\pi^f])]$$

Real interest parity asserts that real required returns on comparable assets are equal across currencies, so that

$$r^d=r^f \tag{5.18}$$

This is a consequence of the law of one price applied to real rates of return in different currencies. If real interest parity holds, then $(1+r^d)$ and $(1+r^f)$ cancel and the nominal interest rate differential reflects the expected inflation differential according to

$$(1+i^d)/(1+i^f)=(1+E[\pi^d])/(1+E[\pi^f]) \tag{5.19}$$

This relation is the **international Fisher equation or Fisher open**. It states that interest rate differential reflects the expected inflation rate differential between the two countries. The international Fisher equation suggests that foreign currencies with relatively high interest rates will depreciate because the high nominal interest rates reflect expected inflation.

Suppose that investors in Australia expect a 4% rate of inflation over the next year and require a real rate of return 3% over the next year; the nominal interest rate on 1-year government notes would be approximately 7%. If a Japanese investor requires the same real rate of return for one year, then the differential in nominal interest rates between Australia and Japan would represent their respective inflation differentials. For example, assume that the nominal interest rate in Japan is 8%. If the Japanese investor requires 3% real return, then the expected inflation rate in Japan over the next year would be 5%. According to the relative PPP theory, the Japanese yen would be expected to depreciate by the expected inflation differential of 1% (Japan's inflation is

1% higher than that in Australia). If the exchange rate changes as expected, Australian investors that attempt to capitalize on the higher Japanese interest rate would earn a return similar to what they could have earned in their own country. This is because when the Australian investors convert the yen into Australian dollar at the end of the investment, they would get fewer Australian dollars.

International Parity Conditions

Now we complete the circuit of international parity conditions relating exchange rates, real and nominal interest rates, and inflation rates among the different currencies. It may be helpful to compare those related theories of international finance. **Figure 5.12** summarizes the main theme of each theory. Note that all those theories are based on the law of one price and all related to the determination of exchange rates. Yet, they differ in their implications. The interest rate parity and forward parity focus on why the forward rate differs

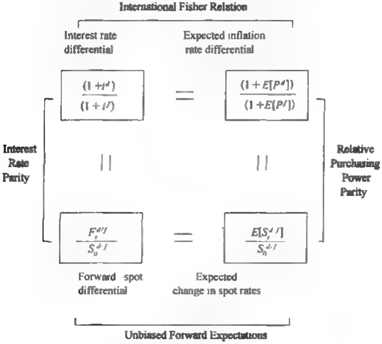

Figure 5.12 International parity conditions (implications of law of one price)

from the spot rate. The relative purchasing power parity focuses on how a currency's spot rate will change over time. The international Fisher relation suggests that interest differential reflects inflation differential between the two currencies.

Forecasting Exchange Rates

Exchange rate determination is complex. Foreign trade and investment involve risk. A major issue, as far as business is concerned, however, is whether forecasting exchange rates is feasible and, if so, how to do it. The managers of MNCs often actively manage the firms' currency risk exposures, hedging when exchange rates are expected to be unfavorable to the MNC, accepting the exposure when exchange rates are expected to favor the MNC. This is an effective strategy if, and only if, the MNC can successfully forecast exchange rate movements.

There are two schools of thought regarding the exchange rate forecasting. The efficient market school argues that the international parity relations are an elegant set of simple equilibrium relationships between the prices of goods and services, interest rates, and the spot and forward exchange rates. Although they are highly stylized and depend on some demonstrably unrealistic assumptions, they constitute a powerful theoretical framework for understanding and explaining the international financial environment and the underlying forces that determine exchange rates and why they vary. For this reason they form the basis for much of the economic analysis involved in exchange rate forecasting. Understanding and interpreting the relationships among them are an important part of the exercise. The other school of thought, the inefficient market school thinks that international parity conditions are not reliable because of the inefficient market. Other forecasting models are needed to predict the changes in exchange rates.

Efficient Market Hypothesis

In an efficient market, currencies are correctly priced based on available information or the prices reflect all available public information, such as money supplies, inflation rates, interest rates, balance of payments and GDP. The

exchange rate will then change only when the market receives new information. According to efficient market hypothesis, forward exchange rates are the unbiased predictors of future spot rates. This does not mean the predictions will be accurate in any specific situation. It means inaccuracies will not be consistently above or below future spot rates; they will be random. Therefore, it is not possible to consistently "beat the market" and earn excess returns in an efficient market.

If efficient market hypothesis holds, exchange rate forecasting can be done on the market conditions.

Market-Based Exchange Rate Forecasts

Market-based exchange rate forecasting is the simplest technique for forecasting exchange rate movements. It focuses on the parity conditions we have learned in this chapter. The forward exchange rate usually indicates whether a currency depreciates or appreciates in the near future. Currencies sold at a forward discount do tend to depreciate while those sold at a premium tend to appreciate. The forward parity, interest rate parity and relative purchasing power parity can be used to forecast the long-run exchange rate movements.

The beauty of market-based forecasts is that anyone with access to a financial newspaper can make them, so it is costless to generate forecasts. Unfortunately, these forecasts do not work well in the short term. But in the long-run, cross-currency inflation and interest rate differentials begin to impose themselves and forecasts based on the parity conditions begin to dominate the current spot rate as predictors of nominal exchange rates.

Contrary to the efficient market hypothesis, some economists believe the foreign exchange market is inefficient. They think the currencies in the market are not always correctly priced and the forward exchange rates will not be the best possible predictors of future spot exchange rates. If the inefficient market hypothesis holds, what techniques should we adopt to correctly forecast the future exchange rates? Basically, there are two methods that professional forecasting analysts wildly adhere to. One is fundamental analysis, while the other is technical analysis.

Fundamental Analysis

Fundamental analysis considers macroeconomic variables and policies that are likely to affect a currency's value. It constructs sophisticated econometric models for predicting exchange rate movements. Those models are statistical estimations of economic theories. The models attempt to incorporate the fundamental variables that underlie exchange rate movements such as trade and investment flows, industrial activity, inflation rates, income levels, and the like.

Fundamental analysts believe that changes in key economic variables will induce changes in future exchange rates in approximately the same patterns as in the past. The formulation of an econometric model requires specifying independent variables like previous quarterly changes in interest rates or inflation rates that influence the dependent variable (for example, quarterly percentage change in a currency's value). Therefore, publicly available information is crucial for model constructors. Fundamental analysts must also identify the nature of the relationship (for example, linear, exponential) that best explains the dependent variable. The established models determine the direction and degree to which a currency's exchange rate is affected by each independent variable.

However, the link between currency values and fundamental information can be difficult to establish. First, obtaining reliable information such as inflation rates or interest rates is not easy. Second, factors that affect exchange rates cannot always easily be quantified. Third, the precise timing of a factor's effect on a currency's exchange rate may be unclear. For example, inflation rate changes may not have their full impact on a currency's value until three or six months in the future. Fourth, exchange rates may respond to fundamental variables with a lag, or only in the long-run.

Unfortunately, researchers found that the fundamental analysis failed to more accurately forecast exchange rates than the market-based exchange rate forecasting models. The Fundamental analysis is best suited for forecasting long-run exchange rate trends. This is because exchange rates in the short run are influenced by many factors that change on a minute-to-minute basis, resulting in considerable short-term volatility.

Technical Analysis

Technical analysts look for specific exchange rate patterns. Technical analysis is similar to technical analysis of stock prices. They believe the past patterns of exchange rate movements are the predictors of the future exchange rates. Once the beginning of a particular pattern has been determined, it automatically implies what the short-run behavior of the exchange rate will be. Clearly, the technical analysis is based on the premise that history repeats itself. However, if the pattern of currency values over time appears random, then technical analysis is not appropriate.

Technical analysis encompasses a variety of charting techniques involving a currency's price, cycles, or volatility. A common starting point for technical analysis is a chart where a trading period's opening, high, low, and closing prices are plotted. Prices are plotted on the charts on a daily basis, and the charts are also created on a weekly, monthly, or yearly basis. Traders watch for new highs and lows, broken trend lines, and patterns that are thought to predict price targets and movements.

Technical analysts construct models to find recurring exchange rate patterns to issue sell or buy instructions if exchange rates deviate from their past pattern. Because technical analysis follows the market closely, it is used to forecast the very short-run exchange rate movements. Determining an exchange rate pattern is useful only as long as the market continues to consistently follow that pattern.

But technical analysis is often dismissed by the academic literatures. Because exchange rates movements are random. Nevertheless, technical analysis has always been popular among practitioners such as the professional traders. If a trader knows that other traders use technical analysis, it can be rational for the trader to use technical analysis too. If enough traders use technical analysis, the predictions based on it can become self-fulfilling to some extent, at least in the short-run.

Summary

1. Under a floating exchange rate regime, the exchange rates are determined by the market forces of the demand and supply of the relative currencies.
2. The demand for foreign exchanges in the foreign exchange market is a

derived demand; that is, the foreign currencies are not demanded because they have an intrinsic value in themselves, but rather because of what they can buy.

3. The demand for and supply of a particular currency determine the value of that currency. The equilibrium exchange rate is a rate at which the quantity of a currency demanded is equal to the quantity supplied. The market "clears" at this exchange rate with no excessive demand or supply.
4. Sometimes policy-makers like to anchor the value of its currency relative to another currency. When the exchange rate deviates from the "target zone", it will be intervened by the central bank. The central bank can buy and sell a particular currency in the foreign exchange market to influence the exchange rate. This is so called market intervention.
5. The law of one price holds that in competitive markets that are free of transportation costs and barriers to trade, identical products sold in different countries must sell for the same price when their price is expressed in the same currency.
6. There are two versions of the purchasing power parity (PPP). The absolute PPP theory states the price of a basket of particular goods should be roughly equivalent in each country.
7. The relative PPP theory predicts that the exchange rate will change if relative prices change (inflation). The currency with relative high inflation will depreciate while the currency with low inflation will appreciate on the spot market.
8. PPP theory usually does not hold in the short run because of the transportation costs and trade barriers, price discrimination and price indices' discrepancy.
9. Interest rate parity states that on free money markets the forward discount or premium on the foreign exchange market is equal to the relative difference between the interest rates on the two currencies. The empirical evidence shows that there is a strong tendency for interest rate parity to hold and that on the Eurocurrency markets it is equivalent to a technical fact.
10. Covered interest arbitrage involves borrowing in one currency, selling the borrowed currency on the spot market, investing the proceeds of the sale,

and simultaneously buying back the borrowed currency on the forward market.

11. Uncovered interest parity is based on the forward parity. Forward parity states that the forward rate will be approximately equal to the expected future spot rate because of the speculation. Uncovered interest parity claims that the nominal interest rates reflect the expected changes in exchange rates and vice versa.
12. According to Fisher equation, each of the nominal interest rates compensates for a required real return and expected inflation. That is: $i \approx r + \pi$, where i is the nominal interest rate, r is the real interest rate and π is the inflation rate.
13. Real interest parity asserts that real required returns on comparable assets are equal across currencies. This is a consequence of the law of one price applied to real rates of return in different currencies.
14. If real interest parity holds, then substituting the Fisher equation in the interest rate parity leads to the international Fisher equation which states that the nominal interest rate differential reflects the expected inflation differential.
15. According to the efficient market school, prices reflect all available public information. If the foreign exchange market is efficient, forward exchange rates should be unbiased predictors of future spot rates. Therefore, a company cannot beat the market by investing in forecasting services.
16. The international parity conditions form the basis for most market-based exchange rate forecasting.
17. Assuming the inefficient market school is correct that the foreign exchange market's estimate of future spot rate can be improved, on what basis should forecasts be prepared? One adheres to fundamental analysis, while the other uses technical analysis.
18. Fundamental analysis draws on economic theory to construct sophisticated econometric models for predicting exchange rate movements. The variables contained in these models typically include relative money supply growth rates, inflation rates, interest rates and balance-of-payments statistics.
19. Technical analysis uses price and volume data to determine past trends, which are expected to continue into the future.

Key Terms

Absolute purchasing power parity (绝对购买力平价)
Big Mac index (汉堡包价格指数)
Commodity arbitrager (商品套利者)
Covered interest parity (抵补套利平价)
Covered interest arbitrage (抵补套利)
Derived demand (衍生需求)
Efficient market (有效市场)
Efficiency market hypothesis (有效市场假说)
Equilibrium exchange rate (均衡汇率)
Fisher equation (费雪方程式)
Forward parity (远期平价)
Fundamental analysis (经济基本面分析预测法)
Import tariffs (进口关税)
International Fisher equation or Fisher open (国际费雪方程式)
Interest rate parity (利率平价)
Law of one price (一价定律)
Market expectations (市场预期)
Market fundamentals (市场基本面，即基本经济变量)
Overvalued currency (估值高估货币)
Price discrimination (价格歧视)
Price index (价格指数)
Purchasing power (购买力)
Quotas (配额制,一般指进口配额)
Real interest parity (实际利率平价)
Real interest rate (实际利率)
Relative purchasing power parity (相对购买力平价)
Technical analysis (技术分析预测法)
Uncovered interest arbitrage (非抵补套利)
Uncovered interest parity (非抵补套利平价)
Undervalued currency (估值低估货币)

Questions

1. Why is the demand for foreign exchange called the derived demand?
2. List several factors that would shift foreign exchange demand curve and supply curve.
3. What is the equilibrium exchange rate? Take an example to show why the equilibrium exchange rate changes.
4. What is the purpose of market intervention by the central bank?
5. Explain the relationship between the law of one price and PPP. Based on the PPP, what is the general forecast of the values of currencies in highly inflated countries?
6. What are some limitations of the purchasing power parity theory?
7. Explain the concept of interest rate parity. Provide a rationale for its possible existence.
8. What is the difference between the covered and uncovered interest arbitrages?
9. Are arbitrage activities good or bad to foreign exchange market? Why?
10. Why would investors consider covered interest arbitrage in a foreign country where the interest rate is lower than their home interest rate?
11. What does the International Fisher Equation say about interest rate and inflation differentials?
12. What is meant by "unbiased predictor" in terms of how the forward rate performs in estimating future spot exchange rates?
13. In a free market, what factors underlie currency exchange values? Which factors best apply to long-run exchange rates and to short-run exchange rates?
14. Why do you think the currencies of the countries with high inflation rates tend to have forward discounts?
15. What is the difference between fundamental analysis and technical analysis?

CHAPTER 6
FINANCIAL DERIVATIVES FOR CURRENCY RISK MANAGEMENT

LEARNING OBJECTIVES

- Compare the forward contracts with the futures contracts
- Examine the features of the futures market
- Understand the marking to market procedure for futures contracts
- Define the call and put options
- Know the option payoff profiles
- Learn how currency options are quoted and used for hedging and speculation purposes
- Introduce direct financing and parallel loan by MNCs
- Explore the currency swap, interest rate swap, and other types of swaps on swap markets

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One of the most important developments in international financial markets over the last three decades is the phenomenal growth of trading in financial derivatives. **Financial derivatives** are financial instruments whose values are derived from an underlying asset such as a stock or a currency. The development and growth of financial derivatives market resulted from the exchange rate volatility. One of the Chicago futures exchange, the **Chicago Mercantile Exchange (CME)**, began trading currency futures contracts in 1972 in response to the dramatic increase in currency risk following the 1971 collapse of the Bretton Woods system. Since then, the turnover of financial derivatives has increased at an astonishing growth rate. Financial managers and international investors found ways to use derivatives as hedging strategies

to reduce risks. However, many traders believed that they could earn significant short-term profits by speculating with derivatives. At the same time, some traders learned that such derivatives speculations can turn out to be wrong and they suffered sizable losses. So the financial derivatives are a powerful tool in the hands of careful and competent financial managers. They can also be very destructive devices when used recklessly.

The financial managers and international investors must understand some basics about the features and structure of the financial derivatives. We will cover three common foreign currency financial derivatives in this chapter, foreign currency futures, foreign currency options and currency swaps. We first examine the differences and similarities between the forward contracts and futures contract. We then discuss the unique features of the futures contracts, and how futures contracts are quoted and used as a hedging strategy. For currency options, we distinguish between call and put options, analyze the option payoff profiles and show how to hedge and speculate with option contracts. Finally, we learn the basics of the currency swap, interest rate swap and other types of swap contracts on swap markets.

Currency Futures

Development of Futures Markets

The introduction of futures markets was originally due to the violent fluctuations of commodity prices such as the prices of crops. Futures markets provided an effective way for those who were exposed to considerable price uncertainty to eliminate, or at least control, this uncertainty. The **Chicago Board of Trade (CBOT)**, the first organized futures exchange was created in 1848 and around 1865 the first "modern" futures contracts were developed. Chicago still remains the world's leading futures center today.

The first currency futures market was opened on May 16, 1972. The Chicago Mercantile Exchange (CME) introduced the futures contracts for the pound sterling, the Canadian dollar, the German mark, the Japanese yen, the Mexican peso, the Swiss franc and the Italian lira. Many other currency futures contracts were initiated later. In 1982 London opened the London International Financial Futures Exchange (LIFFE) which in 2001 was merged with the

Amsterdam, Paris, and Belgium Exchanges to create Euronext. LIFFE. Since then **Euronext** has also merged with the Lisbon Stock Exchange and the **New York Stock Exchange (NYSE)**. In 1985, the CME and the **Singapore International Monetary Exchange (SIMEX)** began offering interchangeable contracts that could be traded on either exchange. This relationship expands the trading hours of these contracts and increases their flexibility as speculative and hedging instruments. In addition to the above exchanges, many other exchanges have been established to trade currency futures.

The growth of currency futures markets has accelerated rapidly since its introduction in the early 1970s. Especially the 1980s and 90s witnessed an astonishing growth of currency futures markets. Turnover of futures contracts including interest rate, currency and equity index traded on international exchanges was $1,381 trillion in 2010①. **Exhibit 6.1** shows the phenomenal growth of the futures contracts traded on world organized exchanges. For example, the number of futures contracts traded on organized exchanges increased by more than 22 times from 288.2 million in 1990 to 6,353.2 million in 2010.

Exhibit 6.1 Turnover of exchange-traded futures contracts
(Number of contracts in millions)

Instruments	1990	2000	2009	2010
Interest rate	219.1	781.2	1,935.9	2,546.1
Currency	29.7	43.6	377.4	1,410.2
Equity index	39.4	225.2	2,258.6	2,396.8
All markets	288.2	1050	4,571.9	6,353.2

Source: *BIS Quarterly Review*, several issues

Forwards versus Futures

A currency forward contract is an agreement to deliver a currency for another at a certain future date for a given price. The two parties involved in a forward contract are usually a financial institution and its client or another

① BIS Quarterly Review, June 2011

financial institution. It costs nothing for any party to enter into a forward contract, but the two parties incur the obligation to ultimately buy and sell the certain currency. Since the forward markets have no physical facilities or buildings like the stock exchanges or futures exchanges, forward contracts are traded in the over-the-counter market consisting of direct communications among major financial institutions.

The major problem with forward contracts is the so called **default risk**. As we know, the forward contracts are pure credit instruments to which no parties are bound. Whichever way the price of the spot rate of exchange moves, one party has an incentive to default. For example, if the forward rate is \$1.50/£, and the spot rate is \$1.55/£ when the contract expires, the party who sells the pound has a strong incentive to default. This is simply because he will lose money if he executes the contract. If the amount of the forward contract is £5 million, his instant loss will be \$250,000. Obviously, the party who sells the pound prefers to sell the pound in the spot market. If the future spot rate turns out to be \$1.45/£, the party who buys the forward pound has an incentive to default because he can get cheaper dollar in the spot market. The default risk tends to limit the forward market to only very high-grade financial and commercial institutions.

Forward markets for foreign exchange have existed for several decades. With the astonishing growth of derivatives markets, we have seen an explosion of growth in forward markets for other instruments. It is now just as easy to enter into forward contracts for a stock index or oil as it was formerly to trade foreign currencies. Forward contracts are also extremely useful in that they facilitate the understanding of futures contracts.

A **futures contract** is very similar to a forward contract. It is also an agreement between two parties to buy or sell a currency at a certain time for a certain price. But a futures contract has its own characteristics. A futures contract is a forward contract that has standardized terms, is traded on an organized exchange, and follows a daily settlement procedure in which the losses of one party to the contract are paid to the other party. **Exhibit 6.2** compares the forward contracts with futures contracts in a number of ways.

Exhibit 6.2 Comparison between forward and futures contracts

Characteristics	Forward contracts	Futures contracts
Amount of contract	Negotiated by two parties, usually \$1 million or even \$5 million at least	Standardized contract, for example, SFr62,500 on Swiss franc
Maturity	Negotiated, from several days to years, typically 1, 2, 3, 6, 9 and 12 months	Standardized, for example, in CME and PSE, the third Monday of March, June, September and December
Location	OTC market	Organized exchanges
Fees	No transaction fees, just the bid-ask spread	Commissions charged per "round term": \$30 in CME
Counterparties	Banks, companies and others	Unknown to each other except the clearinghouse
Settlement	Nearly all the forward contracts need physical delivery of the related currencies	Rarely delivered upon; settlement often takes place through purchase of offsetting position
Collateral	Negotiated, no explicit collateral, depending on customer's credit risk	Initial margin that is marked to market every day (maintenance margin)
Trading hours	24 hours trading	Trading during exchange hours
Regulation	Self-regulating	Futures association

Features of Futures Market

The characteristics of futures contracts can be summarized as follows. First, the futures contracts are **standardized contracts** in terms of the traded currencies, the amount of each contract and the expiration date of the contract. Not all of the currencies have futures contracts. The traded currencies are limited in number. For example, there are only a few of currency futures to be traded on the CME. For each currency there is a specified amount of a contract rather than for a tailor-made sum. For example, the size of the CME's currency futures contracts is:

Australian dollar: A\$ 100,000

British pound: £ 62,500

Canadian dollar: C$ 100,000

Chinese RMB: ¥1,000,000

Euro: € 125,000

Japanese yen: ¥12,500,000

Mexican peso: Peso 500,000

Swiss franc: SFr125,000

Maturities are based on a quarterly cycle of March, June, September and December, and each contract has a precise delivery date. CME contracts expire on the third Wednesday of the contract month. The last trading day is on the second business day immediately proceeding the expiration day (usually Monday).

Second, futures contracts are traded on an exchange. Only commission houses registered as member firms are allowed to trade on the exchange. Clients who seek access to the market must do so through a commission house by opening an account called **margin account**. All orders are then executed through the commission house.

Third, contracts are settled through the exchange's clearing house. The clearing house is the ultimate counterparty of the futures contracts' clients. The clearing house records each traded contract. It manages settlement of day-to-day operations. And it guarantees delivery at the contract's maturity. This feature of the futures contracts provides a remedy for the default risk inherent in forward contracts.

Fourth, clients' accounts are marked to market at the end of each day and clients are subject to margin calls if their position deteriorates. Margins and daily marking to market make client defaults a rare occurrence and reinforce the overall financial soundness of the exchange.

When a client takes a long position on an underlying currency, the client is expected to buy that currency; if a client takes a short position on an underlying currency, he will sell that currency when the contract expires. For instance, if a client takes a long position on pound, the client will buy pound when the contract is due. On the other hand, if he takes a short position on pound, he will sell pound. The client is required to deposit an **initial margin** when he takes a position on a futures contract. The initial margin is usually set high enough so that the cost and inconvenience of frequent small payments can be avoided as

the futures price is marked to market each day. Small losses are simply deducted from the initial margin until a predetermined minimum, called the **maintenance margin**, is reached. At this point, the commission house issues a **margin call** requesting the client to deposit the funds necessary to bring the margin back to the initial level.

Marking to market means that profits and losses are paid every day at the end of trading and is equivalent to closing out a contract each day, paying off losses or receiving gains, and writing a new contract. The following example illustrates how the marking to market procedure works.

On Monday morning a client takes a long position on a Swiss franc futures contract at a price of \$1.20. The amount of a Swiss franc futures contract is for SFr125,000, so the client will pay \$150,000 for SFr125,000 at a future date. The client is required to deposit \$2,000 in his margin account. The clearing house sets the maintenance margin at \$1,500 which means a margin call will be issued if the money deposited in the margin account is less than \$1,500. Just like the spot exchange rates change all the time, the futures price will change accordingly. Now suppose at the end of the day the price has risen to \$1.22. The clearing house settles the client account by the closed price of the Swiss franc futures. Since the price now is up, the client's gain is:

$$(\$1.22/\text{SFr} - \$1.20/\text{SFr}) \times \text{SFr}125{,}000 = \$2{,}500.$$

The client receives \$2,500 and is the owner of a new contract the price of which is now \$1.22. His margin account is \$4,500 at the end of Monday.

On Tuesday evening, the price has fallen to \$1.19 and therefore the client has to pay:

$$(\$1.19/\text{SFr} - \$1.22/\text{SFr}) \times \text{SFr}125{,}000 = \$-3{,}750$$

He now owns a contract the price of which is \$1.19. But the dollar on his margin account falls to \$750 (\$4,500 − \$3,750). The clearing house then issues a margin call to ask the client to deposit \$750 more since the maintenance margin is \$1,500. If the client fails to do so, the contract will be cancelled, and the client loses all the money left in his margin account.

The daily marking to market efficiently overcomes the default risk incorporated in the forward contracts. It ensures that both the trader and clearinghouse's exposure to currency price risk is at most one day. Further, for

every futures contract bought, there is a sold. It is a **zero sum game** for clearinghouse. Maintenance margins and price limits for futures contracts are determined by the exchanges and vary by contract and by exchange.

Reading Futures Quotations

Financial newspapers provide information on many of the currency futures traded on the different exchanges. **Exhibit 6.3** presents typical Canadian dollar (C$) futures quotations from *The Wall Street Journal*. Here, the Canadian dollar futures contract is traded on Chicago Mercantile Exchange. The contract size is for Canadian dollar: C$100,000 and is quoted in U.S. dollars per Canadian dollar.

Exhibit 6.3 Canadian dollar futures quotations
C$ (CME)—CAD 100,000, US$ per C$
(Wednesday July 20, 2011)

Maturity	Open	High	Low	Settle	Change	High	Low	Open interest
Sep 11	1.0509	1.0558	1.0496	1.0540	+.0033	1.0558	.9750	119,802
Dec 11	1.0490	1.0530	1.0483	1.0515	+.0031	1.0530	.9871	3,873
Mar 12	1.0500	1.0500	1.0478	1.0492	+.0029	1.0500	.9880	625

Note: Estimated volume: 70,787; Open interest: 124,719
Source: *Wall Street Journal*, July 21, 2011

The quotation itself is straightforward. *Maturity* refers to the month when each particular contract expires. *Open* means the opening price of the Canadian dollar futures on the day, i.e. the price at which Canadian dollar was first sold when the CME opened in the morning. Depending on overnight events in the world, the opening price may not be identical to the closing price from the previous trading day. The *high*, *low* and *settle* columns indicate the contract's highest, lowest, and closing prices for the day. These figures provide an indication of how volatile the market for the Canadian dollar was during the day. *Change* indicates the change in the closing price from the previous day's settle. For example, for contracts due in September 2011 +0.0033 under the *change* column shows that the closing price on July 20 was 0.0033 higher than the settle price of the previous day which was July 19. In o

closing price of July 19 was \$1.0507/C\$. The next *high* and *low* shows the highest and lowest prices each contract has experienced over its trading history. The *open interest* is the outstanding number of contracts obligated for delivery.

Consider the December futures contract. The opening price of the Canadian dollar futures contract was \$1.0490/C\$. The price rose to \$1.0515/C\$ when the exchange closed. The highest price of this December expired contract was \$1.0530/C\$ and the lowest price was \$1.0483/C\$ during the day. The clearing house will use \$1.0515/C\$ settle price to settle clients' margin accounts. The lifetime high of this particular contract was \$1.0530/C\$ and the lifetime low was \$0.9871/C\$. There are 3,873 outstanding contracts supposed to be executed when they expire.

Assume that a client sells a Canadian dollar futures contract that expires in March 2012 when the CME opens. By selling this futures contract, the client is obligated to sell C\$100,000 for \$105,000 on the third Wednesday of March 2012. If the client no longer wants to maintain such a short position on Canadian dollar before settlement date, he can make a **reversing trade** to close out the contract. That is, he can buy an identical Canadian dollar futures contract so that he neither has to actually deliver or actually receive the Canadian dollar. The gain or loss to the client from its previous futures position is dependent on the price of purchasing futures versus selling futures. For instance, if he buys at the price of \$1.06/C\$, he suffers the loss of \$1,000 (\$0.01 x 100,000). If he buys the Canadian dollar futures at the price of below \$1.05, he gains.

Currency Futures Contracts Used for Hedging or Speculation

Currency futures contracts can be used both for managing risks and assuming speculative positions. The following example shows how to use a futures contract for hedging risk exposure.

The CFO of Texas Instruments Incorporated in the U. S. is considering ways to hedge a 100 million Danish krone (DKr) obligation due in September. The CFO knows that the Danish krone exchange rate usually follows the euro, and there is a strong chance that the euro appreciates against the dollar in the coming months. Euronext in Frankfurt trades DKr/\$ futures contracts that ·mber and have a contract size of \$50,000. The price of the

dollar futures contract now is DKr1.25/$. To cover the transaction exposure, the company could sell September dollar futures contracts, taking a short position. By selling September contracts, the Texas Instrument locks in the right to sell dollars at a set price.

Texas Instruments Inc. sells 1,600 September futures contract for 100 million Danish krone at the price of DKr1.25/$ [(100 million/1.25) / (50,000) = 1,600]. The value of the position at maturity at the expiration of the futures contracts in September — is then (assume the spot exchange rate at maturity is DKr1.20/$)

$$(1.25-1.20)\times 50{,}000\times 1{,}600 = \text{DKr 4 million}$$

The short position on the dollar makes 4 million krone profits for the Texas Instruments. The profits earned from the futures contracts compensate for the loss in the future spot market. Thus, the company effectively covers its risk exposure.

Currency futures contracts can also be used to speculate. If a speculator believes Mexican peso will appreciate against the U.S. dollar, he could buy a peso futures contract, taking a long position. If he anticipates the peso will depreciate against the dollar, he could take a short position, selling pesos for dollars. When the future spot exchange rate turns out to favor the speculator's expectation, he gains; otherwise, he suffers speculative loss. Like we mentioned before, for every futures contract bought, there is a sold. The gain (or loss) of the buyer of a futures contract is mirrored by the corresponding loss (or gain) to the seller of the same contract. Therefore, trading futures contracts is said to be a zero sum game.

Drawbacks of Futures Contracts

The major problem of the futures contract is the mismatch in terms of the amount and timing of the exposures. In most cases, the size of the futures contracts cannot exactly match with the position to be hedged. The users of the futures contracts can only partly hedge their exposed positions.

There are only a few maturity dates available for the futures contracts. The infrequent maturity dates make it unlikely that the futures contracts will correspond perfectly with the maturity of the cash flow to be hedged. Th

mismatch of the maturity can be solved by entering into a **reversing trade** prior to the maturity of the contract. That is, if a hedger buys a futures contract, he can close out its position by selling a futures contract for the same maturity date.

For businesses, futures contracts are often considered inefficient and burdensome because the futures position is marked to market on a daily basis over the life of the contract. Although this does not require the business to pay or receive cash on a daily basis, it does result in more frequent margin calls from its financial service providers than the business typically wants.

Currency Option

The option market was first developed in the early 1980s. It is another major feature of the international financial landscape. For the forward or futures contracts, making a profit or taking a loss depends on the future spot exchange rate. In other words, the return of a forward or futures contracts depends on the investor's prediction on the future spot exchange rate. If the trend of exchange rate movements is clear, the forward and futures contracts enable the investor to avoid potential loss. What if the change in exchange rates is ambiguous, i.e. there is an equally strong chance that exchange rate moves up and down? In this case, it is less appropriate to hedge by a forward or futures contract. The reason for this is that the advantage of avoiding the loss is offset by the disadvantage of missing out on the gain. An option contract makes it possible to take advantage of potential gains while limiting downside risk. Proper use of options requires a clear understanding of their nature and the elements that determine their price.

What is an Option?

A currency option is like a forward or futures contract in that it allows two parties to exchange currencies according to a prearranged date, amount, and rate of exchange. In a forward or futures contract, both parties have an obligation to deliver the related currencies. Unlike a forward or futures contract, an **option** gives the owner of the contract the right but not the obligation to buy or sell a currency at a predetermined price sometime in the [illegible]. The owner of an option contract is usually called the **holder** who buys the

contract. The predetermined price is called **strike price** or **exercise price** which is the exchange rate for buying and selling a currency. If an option contract specifies the right to buy € 125,000 at \$ 1.30/€ (strike price), then the holder of the contract can decide either execute or cancel the contract when it expires. In other words, the holder has the choice to buy or not to buy the euro. For example, if the future spot exchange is above \$ 1.30/€, the holder will exercise the option; otherwise he will abandon the option. The option holder has to pay the **writer** (who issues the contract) for the right he is given. The price paid by the holder to the writer for an option is known as the **option premium** or **option price**.

Therefore, the fundamental difference between option and forward/futures contracts comes down to choice. The holder of an option has the choice; while the writer of an option has the obligation. Once the option is offered, it is the writer's obligation to fulfill the contract. In the above example, if the future spot rate goes down, say \$ 1.25/€, the holder can abandon the contract because he will get cheap euro in the spot market. If the spot rate at the expiration rises to \$ 1.35/€, the holder can force the writer to deliver the euro at the price of \$ 1.30/€. In this case, the writer has the obligation to fulfill the contract.

Call option, put option and option quotations

There are two types of options — calls and puts.

A currency **call option** is the right to buy the underlying currency at a strike price and on a specified date. The **underlying currency** is the currency to be granted by an option contract. The currency to be exchanged for the underlying currency is called **counter currency**. In the above example, the euro is the underlying currency and the dollar is the counter currency. The holder of a call option takes a long position on the underlying currency.

A currency **put option** is the right to sell the underlying currency at a strike price and on a specified date. The holder of a put option takes a short position on the underlying currency.

We can summarize the concept of calls and puts as: The right to buy is called a **call**, while the right to sell is called a **put**. The buyer (**holder**) of an option pays the seller (**writer**), a certain sum, called the **option premium**, for

the right to buy or sell at the prescribed price (**strike price**).

If the right can be exercised at any time during the life of the option it is called an **American option**. It means the holder can buy or sell the underlying currency any time prior to the expiration date. If the right can be exercised only at the option's expiration date, it is called a **European option**. In this case, the holder can buy or sell the underlying currency only at the maturity of the contract.

Currency option quotations are available daily in *The Wall Street Journal* and in many newspapers in large cities. **Exhibit 6.4** shows two typical option quotations on CME. The first is a sterling pound option with the contract size of £62,500 and the second is a Japanese yen option with the contract size of ¥12,500,000. Both options traded on CME are American options and can be exercised at any time prior to maturity. Let's examine the pound option and show how to read the quotation. The option premiums are quoted in cents per pound. The first column is the different strike price. "1620" means the right to buy or sell the pound at the price of $1.620 per pound. The column under the "Calls-Settle" and "Puts-Settle" lists the closing prices (option premium) for different contracts respectively. For example, "2.78" refers to 2.78 U.S. cents, the premium cost of the call option at a strike of $1.620/£ expiring in September, 2011. Suppose you purchase 10 contracts, your total option premium would be:

$$\$0.0278/£ \times £62,500 \times 10 = \$17,375$$

Exhibit 6.4 Currency option quotations

British pound (CME)

Contract GBP62,500, quoted in cents per pound

Strike price	Calls-Settle			Puts-Settle		
	Aug	Sep	Dec	Aug	Sep	Dec
1620	1.81	2.78	4.46	0.77	1.74	3.60
1630	1.20	2.21	3.91	1.16	2.17	4.05
1640	0.71	1.72	3.40	1.70	2.68	4.54
1650	0.43	1.31	2.93	2.39	3.27	5.06
1660	0.23	0.97	2.51	3.19	3.93	5.64
1670	0.12	0.71	2.14	4.08	4.66	6.27

Japanese yen (CME)
Contract JPY12,500,000, quoted in cents per ¥100

Strike price	Calls-Settle			Puts-Settle		
	Aug	Sep	Dec	Aug	Sep	Dec
1190	8.51	8.58	9.15	0.01	0.09	0.59
1195	8.01	8.09	8.73	0.01	0.10	0.67
1200	7.51	7.61	8.33	0.01	0.12	0.76
1205	7.02	7.13	7.92	0.02	0.14	0.85
1210	6.52	6.65	7.53	0.02	0.16	0.96
1215	6.03	6.19	7.14	0.03	0.20	1.07

Source: *Wall Street Journal* July 21, 2011

Similarly, a put option (right to sell pounds) for \$1.650/£ expiring in December 2011 can be bought for 5.06 U.S. cents per pound.

It should be noted that the Japanese yen option quote is a little bit different. The strike price 1190 refers to \$1.190 per ¥100. The premium is quoted in U.S. cents per 100. For example, "7.13" means that you have to pay 7.13 U.S. cents for every one hundred Japanese yen you buy at the strike price of \$1.205. This call option contract expires in September 2011. Suppose that a client buys 100 September contracts, he has to pay the CME the total premium of:

$$12,500,000/100 \times 0.0713 \times 100 = \$891,250$$

Exhibit 6.5 Top 30 derivatives exchanges worldwide

(Ranked by number of futures and options traded and/or cleared in 2010)

Rank	Exchange	2009	2010	% Change
1	Korea Exchange	3,102,891,777	3,748,861,401	20.8%
2	CME Group (includes CBOT and Nymex)	2,589,555,745	3,080,492,118	19.0%
3	Eurex (includes ISE)	2,647,406,849	2,642,092,726	−0.2%
4	NYSE Euronext (includes U.S. and EU markets)	1,729,965,293	2,154,742,282	24.6%

Continued

Rank	Exchange	2009	2010	% Change
5	National Stock Exchange of India	918,507,122	1,615,788,910	75.9%
6	BM & FBovespa	920,375,712	1,422,103,993	54.5%
7	CBOE Group (includes CFE and C2)	1,135,920,178	1,123,505,008	−1 1%
8	Nasdaq OMX (includes U.S. and Nordic markets)	815,545,867	1,099,437,223	34.8%
9	Multi Commodity Exchange of India (includes MCX−SX)	385,447,281	1,081,813,643	180.7%
10	Russian Trading Systems Stock Exchange	474,440,043	623,992,363	31.5%
11	Shanghai Futures Exchange	434,864,068	621,898,215	43.0%
12	Zhengzhou Commodity Exchange	227,112,521	495,904,984	118.4%
13	Dalian Commodity Exchange	416,782,261	403,167,751	−3.3%
14	Intercontinental Exchange (includes U.S., U.K. and Canadian markets)	263,582,881	328,946,083	24.8%
15	Osaka Securities Exchange	166,085,409	196,350,279	18.2%
16	JSE South Africa	174,505,220	169,898,609	−2.6%
17	Taiwan Futures Exchange	135,125,695	139,792,891	3.5%
18	Tokyo Financial Exchange	83,678,044	121,210,404	44.9%
19	London Metal Exchange	111,930,828	120,258,119	7.4%
20	Hong Kong Exchanges and Clearing	98,538,258	116,054,377	17.8%
21	ASX Group (includes ASX and ASX 24)	82,200,578	106,386,077	29.4%
22	Boston Options Exchange	137,784,626	91,754,121	−33.4%
23	Tel-Aviv Stock Exchange	70,914,245	80,440,925	13.4%
24	London Stock Exchange Group (includes IDEM and EDX)	77,490,255	76,481,330	−1.3%
25	Mercado Espanol de Optiones y Futuros Financieros	93,057,252	70,224,176	−24.5%
26	Turkish Derivatives Exchange	79,431,343	63,952,177	19.5%
27	Mercade a Termino de Rosario	51,483,429	62,046,820	20.5%

Continued

Rank	Exchange	2009	2010	% Change
28	Singapore Exchange (includes Sicom and AsiaClear)	53,237,389	61,750,671	16.0%
29	China Financial Futures Exchange	0	45,873,295	NA
30	Bourse de Montreal	34,753,081	44,296,907	27.5%

Source: *Futures Industry Association* "Annual Volume Survey" March 2011

Markets in Currency Options

The **Philadelphia Stock Exchange (PSE)** is the first organized exchange to trade the standardized currency options (1982). Today, currency options are traded not only on the organized exchanges but on the over-the-counter market as well. Like the futures trading, option markets have experienced tremendous growth in the last several decades. **Exhibit 6.5** lists the top 30 world derivatives exchanges based on contract volume. Options traded on organized exchanges are standardized contracts, whereas over-the-counter options are tailored to fit the needs of the customers. Over-the-counter options are written by commercial and investment banks. Generally, these contracts are written for large amounts, at least $1 million of the currency serving as the underlying asset. If a customer wishes to purchase an over-the-counter option, he will normally call a bank, specify the currencies, maturity, strike price and ask for the premium. The bank will normally take a few minutes to a few hours to price the option and return the call. Over-the-counter options are typically European options.

Exchange-traded options are conducted by floor brokers. A customer calls his broker to place an order to purchase a specific option on a particular currency. The broker owns a specific "seat" on an exchange which allows him to trade various option contracts. A seat on the CME's Index Option Market (IOM) sold for $400,000.

Intrinsic and Time Value of an Option Contract

Options differ from all other financial derivatives in that the option holder has the choice of executing the contract or abandoning the contract. The option holder will exercise his right only when exercising is profitable, which means

only when the contract has value. **Figure 6.1** plots the dollar value of a purchased Mexican peso call option as a function of the spot rate of exchange between dollars and pesos at expiration. The time subscripts t on the call option value and on the spot exchange rate are reminders that these are values at expiration.

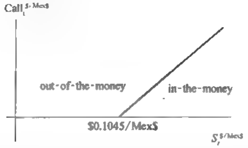


Figure 6.1 The intrinsic value of a call option

If the future spot rate is above the exercise price \$0.1045/Mex\$, this Mexican peso call option will be exercised. In this case, the option is said to be **in-the-money**. If a call option is in-the-money, it has intrinsic value. The **intrinsic value** is the gain that would be realized if an option was exercised immediately. So the intrinsic value for a call option is the difference between the future spot rate and strike price.

Call option intrinsic value when exercised = Max $[(S_t^{d/f} - K^{d/f}), 0]$ (6.1)

$S_t^{d/f}$ is the spot exchange rate at time t, $K^{d/f}$ is the strike price. In our example, suppose the future spot rate turns out to be \$0.1145/Mex\$, the intrinsic value of this Mexican peso call option is:

\$0.1145/Mex\$ − \$0.1045/Mex\$ = \$0.01/Mex\$

A call option for which the spot exchange rate is below the strike price is called **out-of-the-money**. In that case, the option has no intrinsic value, or the intrinsic value is zero. For example, if the spot rate is \$0.10/Mex\$ or \$0.09/Mex\$, the option has no intrinsic value. The intrinsic value under those exchange rates is ZERO!

If the future spot rate equals the strike price, the call option is **at-the-money** with no intrinsic value.

Figure 6.2 graphs the dollar value of a Mexican peso put option at expiration. Currency put options are options to sell the underlying currency (in this case, the Mexican peso), so these options are in-the-money when the strike

price is higher than the future spot exchange rate. The intrinsic value of a put option is calculated as:

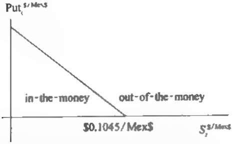


Figure 6.2 The intrinsic value of a put option

Put option intrinsic value when exercised = Max $[(K^{d/f} - S_t^{d/f}, 0]$ (6.2)

If the spot rate at time t is \$0.1000/Mex\$, the intrinsic value of this peso put option is:

\$0.1045/Mex\$ − \$0.1000/Mex\$ = \$0.0045/Mex\$

A put option for which the spot exchange rate is above the strike price is called **out-of-the-money**. In that case, the option has no intrinsic value, or the intrinsic value is zero no matter what future spot exchange rate is.

If the future spot rate equals the strike price, the put option is **at-the-money** with no intrinsic value.

In addition to the intrinsic value, an option also has time value prior to the maturity date. **Time value** is the option premium less the intrinsic value. The time value reflects the fact that an option may have more ultimate value than its intrinsic value.

Time value = option premium−intrinsic value (6.3)

Since American options can be exercised prior to maturity, it is possible that at some time prior to expiration an out-of-the-money option will become an in-the-money option. If the option is already in-the-money, it can further increase its value. This prospect gives an option a value greater than its intrinsic value.

For example, if a call option valued at 1.06 cents to buy sterling at \$1.64/£ and the spot rate is \$1.65/£, the option's intrinsic value is 1 U.S. cent. The time value is 0.06 U.S. cents. If the spot rate is \$1.60/£, the option's intrinsic value is zero. The time value is then 1.06 cents. The time

value exists, meaning investors are willing to pay more than the immediate exercise value, because the option may move more in-the-money, and thus become more valuable, as time elapses. Time value goes down as the maturity date nears and is zero at expiration date.

Hedging with Options

Firms with long or short foreign exchange positions can use currency options to minimize their transaction and translation exposure. Like we discussed before, option contracts differ from forward and futures contracts. As future spot exchange rate moves away from the strike price, option values follow a one-way path. Currency call option holders gain when the future spot rate rises above the strike price, but cannot lose more than the option premium as the spot rate falls below the strike price. Put option holders gain as the future spot rate falls below the strike pricc, but lose, at most, the option premium as the spot rate rises. It is this asymmetry that gives options their unique role as a disaster hedge.

Suppose a Japanese exporting company expects a $156,250 cash inflow on June 20, which happens to be a Friday on which CME currency options expire. Even though the financial manager of the firm fears that the dollar depreciates against the yen in the following months, he is not too sure that this will actually happen. One of the strategies that the firm can use to eliminate this exposure is to sell $156,250 and buy Japanese yen at the forward exchange rate with an expiration date on Friday, June 20. The disadvantage of this forward contract is that the firm cannot benefit from the possible appreciation of the dollar.

The financial manager of this Japanese exporting company can buy a yen call option on CME to solve his problem. In contrast to forward contracts, option payoffs are asymmetric. If the value of the dollar rises, the firm with a yen call option lets the contract expire. The company captures the full benefit of the higher value of the dollar without any further gain or loss from the call option contract. If the dollar depreciates against the yen, the firm is compensated by the contract. Because of the characteristic shape of an option's payoff profile, currency options are used as a form of insurance or "disaster hedge" against unfavorable changes in the value of a currency. When used to hedge currency risk, currency options allow the option holder to participate in

gains on one side of the strike price while limiting losses on the other side.

Profit and Loss on a Currency Call Option at Expiration

Options can also be used to speculate changes in exchange rates. Since option holders need to pay premium when they purchase option contracts, the premium costs affect profit and loss of option contracts when they are exercised. Consider the following example. A speculator thinks the yen might appreciate against the dollar next month. He decides to try his luck in option market. He finds the Japanese yen call option quoted as "JPY June 1250 call" selling on the CME at a price of \$0.000328/¥ (premium). What is the potential profit or loss of this yen call option at expiration?

The contract specification is summarized as follows:

$K^{\$/¥} = 0.0125$ (Strike price)

Contract size = ¥12,500,000 (CME standard)

Expiration date: June 20 (third Wednesday, CME standard)

Current call option price = \$0.000328/¥ (premium)

Figure 6.3 displays the profit or loss at the expiration of a currency call option as a function of the possible future spot exchange rate. The speculator buys one contract. The premium he must pay for the contract:

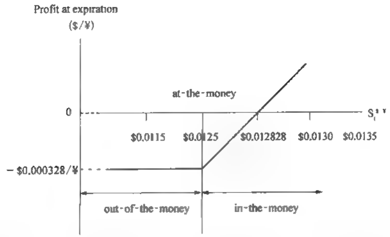
Premium cost = (\$0.000328/¥) (¥12,500,000) = \$4,100

If the future spot rate is above the strike price, the speculator will exercise the option. The amount of the dollars he will deliver to the CME is the cost of exercising the option.

Cost of exercise = (\$0.0125/¥) (¥12,500,000) = \$156,250

The profit or loss of this contract depends on the future spot exchange rate. If the speculator's guess is wrong, he will abandon the contract, suffering a net loss of the premium. That is the scenario when the spot exchange at the expiration is the same as or below the strike price (\$0.0125/¥). If the future spot exchange rate is above the strike price, such as \$0.012828/¥, the speculator will exercise the option. He pays \$156,250 for ¥12,500,000. He then sells the yen for dollar on the spot market and gets:

¥12,500,000 × \$0.012828/¥ = \$160,350



Exchange rate	$ 0.0115/¥	$ 0.0125/¥	$ 0.012828/¥	$ 0.0130/¥	$ 0.0135/¥
Payments					
Premium cost	– $ 4,100	– $ 4,100	– $ 4,100	– $ 4,100	– $ 4,100
Cost of exercise	$ 0	$ 0	– $ 156,250	– $ 156,250	– $ 156,250
Receipts					
¥ sale	$ 0	$ 0	$ 160,350	$ 162,500	$ 168,750
Net profit or loss	– $ 4,100	– $ 4,100	$ 0	$ 2,150	$ 8,400

Figure 6.3 Profit/loss on a call option at expiration

The amount of $ 160,350 just covers the $ 156,250 exercise price and the original $ 4,100 option premium. The speculator breaks even in this option contract! $ 0.012828/¥ is the break-even exchange rate for this particular contract. The break-even rate for a call option is the sum of the option strike price and option premium.

If the future spot exchange rate is between the strike price and break-even rate, the option holder is partly compensated. We can see from the figure that the premium is partly offset.

Profit and Loss on a Currency Put option at Expiration

Figure 6.4 shows profit or loss at the expiration of a currency put option as a function of the future spot exchange rate. Consider a Philadelphia Stock Exchange (PSE) "British pound Dec 15900 put" selling at $ 0.0175/£. Options traded on

PSE are European options which can be exercised only at maturity.

The terms and conditions of this quote are as follows:

$K^{\$/£} = 1.5900$ (strike price)

Contract size — £31,250 (PSE standard)

Current put option price — \$0.0174/£ (premium)

Expiration date: third Wednesday in December (PSE standard)

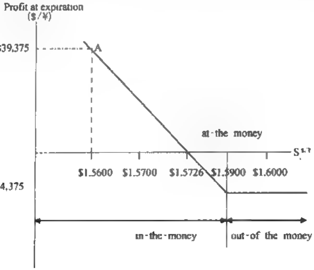
Assume a speculator buys 100 pound put option contracts. The premium he pays is:

Premium cost = (\$0.0174/£) (£31,250) (100) = \$54,375

The contract is out-of-the-money if the future spot rate is equal to or greater than \$1.5900/£. The speculator loses whole amount of the premium of \$54,375. If the spot exchange rate is lower than the break-even rate of \$1.5726/£ (\$1.5900/£ − \$0.0174/£), the transaction will be profitable. For example, if the spot rate is \$1.5600/£, the speculator needs to purchase the pound at the spot market. The dollar payment is:

(\$1.5600/£)(£31,250)(100) = \$4,875,000

Then he exercises the option in the exchange, receiving \$4,968,750. His net profit from the transaction is \$39,375 (\$4,968,750 − \$4,875,000 − \$54,375) which is shown in the **Figure 6.4** by point A.



Exchange rate	$1.5600/¥	$1.5700/¥	$1.5726/¥	$1.5900/¥	$1 6000/¥
Payments					
Premium cost	− $54,375	$54,375	− $54,375	− $54,375	− $54,375
Spot £ purchase	− $4,875,000	− $4,906,250	− $4,914,375	$0	$0
Receipts					
Exercising contract	$4,968,750	$4,968,750	$4,968,750	$0	$0
Net profit or loss	$39,375	$8,125	$0	− $54,375	− $54,375

Figure 6.4 Profit/loss on a put option at expiration

Currency Swaps

A **currency swap** involves the exchange of principal and interest in one currency for the same in another currency. It is considered to be a foreign exchange transaction and is not required by law to be shown on a company's balance sheet. A forward contract is a simple form of a swap. Whereas a forward contract leads to the change of only principal at a future date, swaps typically involve exchanges of both principal and interests during the life of the contract.

Background of the Currency Swaps

When the MNCs finance their businesses for their foreign subsidiaries, they can borrow from the mother country and exchange for the currencies they need. They face the currency risk however. One of the alternatives that they can use to cover the risk is to raise debt directly in the foreign market, but the MNCs have disadvantage compared to the local companies. For example, if a German subsidiary of a U.S. multinational company needs to issue a euro-denominated bond since it could make payments with euro inflows to be generated from existing operations. However, this firm is not well known to investors that would purchase these bonds. Even though they do consider buying these bonds, they may require high return. On the other hand, the local companies have established reputations and their information costs are relatively low. It is often the case that the local companies' borrowing costs are lower than those of the

foreign companies in the domestic financial markets.

During the 1970s, the United Kingdom implemented foreign exchange controls. All cross-border currency transactions involving pounds were taxed. This made it expensive for both U. K.-based and foreign-based MNCs to transfer funds to or from their foreign subsidiaries. In the pursuit of a new funding method that could get around the foreign exchange taxes, the so called parallel loan (or back-to-back loan) was created.

A **parallel loan** is a funding method by which two borrowers can exchange the type of funds each one can most easily raise for the type of funds each really wants. For example, Volkswagen can easily raise euro funds in German financial market, but it needs sterling pound to finance its operation in U. K.; a British firm, BP, may have exactly the opposite problem. **Figure 6. 5** presents a possible parallel loan arrangement.

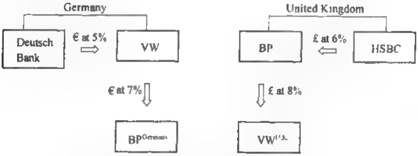


Figure 6. 5 A parallel loan between VW and BP

VW borrows euros from Deutsch Bank at the interest rate of 5% and then lends the euro to German subsidiary of BP at 7% annual interest rate. Similarly, BP raises sterling funds from HSBC at the interest rate of 6% and then lends pounds to VW in U. K. at 8%. Both VW and BP earn 2% of the face amount in annual interest.

The advantages of the parallel loan are: First, it successfully gets around the U. K. foreign exchange tax, because neither VW nor BP needs cross-border foreign exchange transactions. The euros raised by VW can be sent directly to BP within Germany, just as pounds raised by BP can be sent directly to VW within the United Kingdom. Second, both companies save the cost of currency transactions and more importantly, reduce exposure to currency risk. Third, both companies enjoy relatively low borrowing costs through the parallel loan.

The benefits of parallel loan are especially valuable for MNCs with exposures in multiple currencies.

The parallel loan has several disadvantages. First is the default risk. If one party defaults, the other party does not release from its obligation to its bank. Second, both companies' outstanding liabilities are increased. The increased outstanding liabilities impair the ability of the parent firm to raise additional debt. Third, the parallel loan is time-consuming and expensive to establish. It is very difficult to find a partner (counterparty) for the currency, amount, and timing desired. When parallel loans were first introduced, MNCs usually asked for help from the investment banks. Investment banks acted as brokers rather than dealers. The absence of dealers able to make a market in parallel loans resulted in high search costs and slow growth.

Currency Swap

A swap contract can correct the problems of the parallel loan. It releases each party from its obligation should the other party default on its obligation. Most countries treat swaps as off-balance-sheet transactions, which mean the loan under a swap contract is not capitalized on the balance sheet. Thus, the swaps do not create the appearance of high levels of debt on the firm's consolidated balance sheet. The first currency swap was arranged by two U.S. banks — Continental Illinois and Goldman Sachs in 1976. A Dutch MNC Bos Kallis and a British MNC ICI Finance were the two parties in this agreement. Since then, the swap market has grown by leaps and bounds. One of the main reasons for the phenomenal growth of the swap market has been that they enable participants to raise funds more cheaply than would otherwise be the case.

The swap markets are facilitated by over-the-counter trading rather than trading on organized exchanges. Swap contracts are less standardized than other financial derivatives such as futures or options. Thus, a telecommunications network is more appropriate than an exchange to work out specific provisions of swaps.

The most common form of currency swap is the currency coupon swap which is a fixed-for-floating rate nonamortizing currency swap, traded primarily through international commercial banks. A **nonamortizing loan** means the entire principal is repaid at maturity and only interest is paid during

the life of the loan. Currency swaps also come with **amortizing loans** in which periodic payments spread the principal repayment throughout the life of the loans. Currency swaps can be structured as fixed-for-fixed, fixed-for-floating, or floating-for-floating swaps of either the nonamortizing or amortizing variety.

Commercial banks are very active in the swap markets. They are the market dealers and quote the swap prices on a daily basis. **Exhibit 6. 6** is a possible swap quotation by Morgan-Chase Bank. The quote is for a nonamortizing fixed-for-floating currency coupon swaps between British pound (£) and U.S. dollars with semiannual interest payments on maturities of one to five years.

Exhibit 6. 6 Morgan-Chase Bank currency coupon swaps quotes

Currency Coupon Swaps (£/ $)		
Maturity	Bid (in £)	Ask (in £)
1 year	0.91 %	0.94 %
2 years	1.36%	1.40%
3 years	1.65%	1.69%
4 years	1.96%	2.01%
5 years	2.26%	2.31%

Semi-annual interest payments
All quotes against 6-month dollar LIBOR flat

For example, a U. K. subsidiary of U. S. based multinational company needs a two-year 1 million sterling pound loan with fixed interest payment. The company can reach a swap agreement with Morgan-Chase. It receives £ 1million from the bank and pays interest at 0.70% (1.40%/2) every six months. According to the swap agreement, the company gives the equivalent U. S. dollar of the £ 1 million to the bank and receives the interest at the 6-month dollar LIBOR rate. The two parities swap the related currencies at the end of the contract. **LIBOR** is the acronym for London Inter Bank Offered Rate. This is the rate at which banks lend to each other. LIBOR is used as a bench-mark for variable-rates loans within

the U. K. and internationally.

The swap bank makes profit by the bid-ask spread. The above quotes show the spread is 3 to 5 basis points.

An Example of a Currency Swap

Assume that AT & T has $100 million of 3-year debt at a floating rate of 6-month ($) LIBOR flat. The U. K. subsidiary of AT & T needs fixed-rate British pound for daily operations. The firm reaches a swap agreement with JP Morgan-Chase. According to the swap contract, JP Morgan-Chase agrees to pay AT & T's floating-rate dollar debt in exchange for a fixed-rate sterling payment from AT & T. Suppose the spot exchange rate is $S^{\$/\pounds} = 1.60$. At this spot rate, $100 million is equal in value to £62.5 million.

JP Morgan-Chase receives fixed-rate pound interest payments at a rate of 1.69% on the principal amount of £62.5 million. JP Morgan pays the floating 6-month LIBOR Eurodollar rate. **Figure 6.6** shows the cash flow of this transaction:

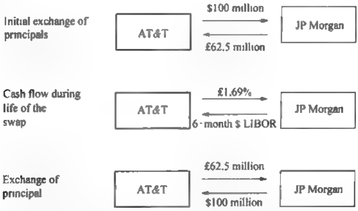


Figure 6.6 A Currency swap between AT & T and JP Morgan-Chase

JP Morgan-Chase gives AT & T the £62.5 million it requires while the AT & T gives JP Morgan-Chase the $100 million as the initial exchange of principal. Next is the periodic exchange of interest payments by the two parties, AT & T pays JP Morgan 0.845% (1.69%/2) sterling every six months, while JP Morgan pays Eurodollar LIBOR to AT & T at the same time. Finally after three years we have the final exchange of principal. AT & T pays JP Morgan-Chase £62.5

million back while JP Morgan-Chase will pay AT & T \$ 100 million back.

In effect the currency swap has enabled the AT&T to raise the 62.5 million it required at 1.69% fixed rate, thus saving it over what it would cost to raise the funds itself in the United Kingdom. The swap contracts have also enabled MNCs who face currency risk to hedge their long-term foreign exchange exposures. Prior to the development of swap markets most firms used the forward contracts to hedge the foreign exchange risk. However, most forward contracts are for less than one year. In order to hedge a 3-year position a firm would have to take out an annual forward contract for each of the next three years.

Interest Rate Swaps

An **interest rate swap** is a variant of the currency swap in which two parties make a series of interest payments to each other, with both payments in the same currency. One payment is variable, and the other payment can be variable or fixed. In an interest rate swap, the principal is called **notional principal** because it is in the same currency and needn't be exchanged. Notional principal is used only to calculate interest payments. Only the difference check between the interest payments is exchanged when interest payments are due.

The most common type of interest rate swap, indeed the most common type of all swaps, is a swap in which one party pays a fixed rate and the other pays a floating rate interest pegged to an interest rate index, such as 6-month LIBOR. Commercial banks will tailor the terms of interest rate to customers' needs. They also make a market in interest rate swaps and provide current market quotations. For example, Citigroup might quote prices on a U.S. dollar coupon swap as shown in **Exhibit 6.7**. The quotes are for nonamortizing debt and fixed-for-floating dollar rates. The floating rate is pegged to 6-month dollar LIBOR. Interests are settled every six months. The Citigroup quotes a fixed-rate bid-ask spread semiannual in basis points (bps) above U.S. Treasuries versus six-month dollar LIBOR flat. For instance, the quote for a three-year swap with semiannual payments is 3-year T+15bps bid and 3-year T+37bps ask. Three-year Treasury notes are currently yielding 2.85%, the interest rate swap bid-ask spread quotation is:

$$0.0285 + 0.0015 = 3\% \text{ bid}$$

$$0.0285 + 0.0037 = 3.22\% \text{ ask}$$

Exhibit 6.7 Citigroup interest rate swaps quotes

Coupon Swaps ($ s)			
Maturity	Bank pays Fixed Rate	Bank Receives Fixed Rate	Current TN Rate
2 years	2 yr TN +10bps	2yr TN +25bps	2.05%
3 years	3 yr TN +15bps	3 yr TN +37bps	2.85%
4 years	4 yr TN +20bps	4 yr TN +43bps	3.45%
5 years	5 yr TN +30bps	5 yr TN +55bps	4.05%

This schedule assumes nonamortizing debt and semiannual interest payments.
All quotes are against 6-month dollar LIBOR flat.
TN = U.S. Treasury note rate.

This means the Citigroup will pay semiannual fixed rate dollar payments of 3% against receiving six-month dollar LIBOR flat, or it will receive semiannual fixed-rate dollar payments at 3.22% against paying six-month dollar LIBOR flat.

An Example of an Interest Rate Swap

Consider Exxon-Mobil that enters into a 5-year $50 million interest rate swap with Citigroup. The initiation date is June 15. Exxon-Mobil will pay Citigroup fixed payments a rate of 4.05% plus 55 basis points on December 15 and June 15 during the next 5 years. So Citigroup will have a cash inflow on December 15, the first payment date, of

$$(\$50,000,000)\times[(0.0405+0.0055)/2]=\$1,150,000$$

The swap calls for Citigroup to make payments to Exxon-Mobil based on 180-day LIBOR on the 15^{th} of December and June for the next 5 years. The payment is determined by LIBOR at the beginning of the settlement period. Payment is then made at the end of the settlement period. Thus, the payment on December 15 is based on LIBOR on the previous June 15. Suppose the dollar LIBOR on June 15 is 4.4%, then on December 15, the first payment date, Citigroup will pay Exxon-Mobil:

$$(\$50,000,000)\times(0.044/2)=\$1,100,000$$

The two parties agree to net the payments in order to reduce the flow of money, which reduces the default risk. Therefore, only the difference of

$ 50,000 is paid by Exxon-Mobil to Citigroup on December 15. So if LIBOR exceeds fixed rate, Citigroup will make a payment to Exxon-Mobil.

Other Types of Swaps

Swaps are designed with the intention of reducing the risk of unexpected changes in a financial price, such as currency values, interest rates, or commodity prices. Therefore, swaps can be traded on any financial asset or liability. There are a lot of customized swaps created for a wide variety of other assets and in a wide variety of combinations.

Commodity swap is a swap in which exchanged cash flows are dependent on the price of an underlying commodity. It is usually used to hedge against the price of a commodity. The two parities can swap two different commodities or the same commodity. The first commodity swap was a fixed-for-floating oil price swap engineered by Chase Manhattan Bank in 1986. The vast majority commodity swaps involve oil. Usually airline companies who consume a lot of oil might use commodity swaps to lock in the price of oil. It pays a financial institution the fixed price of oil. In return the financial institution pays the company floating oil price.

Swaps can be arranged for any commodity that has a reliable reference price. These prices can be futures prices or spot prices reported by well-known exchanges or specific organizations such as Platt's.

Equity swap is a swap which involves the exchange of interest payments for payments linked to the degree in a stock index. This type of swap arrangement may be appropriate for portfolio managers of insurance companies or pension funds that are managing stocks and bonds. The swap would enhance their investment performance in bullish stock market periods without requiring the managers to change their existing allocation of stocks and bonds. For example, mutual funds manager A has invested in S & P 500 stock index and pension funds manager B has a portfolio of T-bonds. Now Mr. A thinks the stock market will be weak next year and likes his investment in bond market. Mr. B, on the other hand, wishes to get into stocks market. Two managers could reach an equity swap in which Mr. A pays Mr. B the S & P 500 index return and Mr. B pays Mr. A the returns from his T-bonds portfolio.

Swaption (Swap Option) is the option to enter into an interest rate swap. In

exchange for an option premium, the buyer gains but not the obligation to enter into a specified swap agreement with the issuer on a specified future date. The agreement will specify whether the buyer of the swaption will be a fixed-rate receiver (like a call option on a bond) or a fixed-rate payer (like a put option on a bond). For example, a financial manager of an MNC knows that in three months time the company has to fund a big investment project with 5-year floating rate notes but wants to swap into fixed interest payments. The manager could sign a call swaption giving him the right to receive 3-month LIBOR and pay fixed rate for five years starting in three months. The financial manager wants to fix the rate at 6%. If three months later the fixed rate for a 5-year interest swap is higher than 6% he will exercise the option and obtain the swap for 6%. If it is lower than 6% he will abandon the swaption and sign a interest rate swap on the current terms.

Summary

1. Financial derivatives are financial instruments that have returns based on the expected future price movements of the asset to which it is linked — called the underlying asset — such as a currency or a share. Traders may use derivatives to hedge against interest rate and foreign exchange risk. They also may use derivatives to try to earn profits based on speculations about future movements in interest rates and exchange rates.
2. Forward contracts, currency futures, currency options and currency swaps are derivatives to hedge against foreign exchange risk or to speculate changes in exchange rates. Forward contracts are pure credit instruments and are therefore subject to default risk.
3. Futures contracts are similar to forward contracts. The smaller size of the contract and the possibility of liquidating a position quickly and cheaply in an organized market are advantageous to small users as well as those with steady streams of income and expenditures. Futures contracts also reduce the risk of default relative to forward contracts through the following conventions:
   - An exchange clearinghouse takes one side of every transaction.
   - An initial and a maintenance margin are required.

- Futures contracts are marked to market on a daily basis.

4. The disadvantages of the futures contracts are the limited number of traded contracts and delivery dates. It also causes the mismatch between the contract size and the actual currency risk exposure.
5. Options markets offer special opportunities for hedging and speculation. They are especially suited to situations where wide swings in the exchange rate are expected. Speculation on a sharp price rise involves buying calls while speculation on a sharp fall involves selling puts. Speculation on price stability involves selling calls or puts.
6. A short position in foreign exchange can be hedged by buying a call on foreign exchange and a long position can be hedged by buying a put on foreign exchange.
7. A currency call option is the right to buy the underlying currency at a specified price and on a specified date.
8. A currency put option is the right to sell the underlying currency at a specified price and on a specified date.
9. If you sell or write a currency call option, the buyer of the option has the right to buy one currency with another currency at the contract's exercise price, or strike price. If you write a currency put option, the buyer of the option has the right to sell one currency with another currency at the contract's exercise price.
10. If the right can be exercised at any time during the life of the option it is called an American option. If the right can be exercised only at the option's expiration date, it is called a European option.
11. The buyer of the option pays the seller, or "writer", a certain sum, called the option premium, for the right to buy or sell at the prescribed price.
12. When an option contract has intrinsic value, it is called in-the-money. When an option contract has no intrinsic value, it is called out-of-the-money. When the future spot rate of exchange is equal to the exercise price, the option contract is called at-the-money. All options have time value before the expiration date and no time value when option contracts expire.
13. Option premium $-$ Intrinsic value $+$Time value
14. A currency swap refers to the exchange of principal and interest in one

currency for the same in another currency. A forward contract is a simple form of a swap because the forward contract does not involve the exchange of interest.

15. Like forward contracts, currency swaps can be used to eliminate the foreign exchange risk inherent in a temporary long or short position in foreign currency.
16. Currency swaps solve the problem of foreign exchange risk when financing cannot be obtained in the currency in which the cash flows are generated.
17. The most common form of interest rate swap is the fixed-for-floating interest rate swap. The principal in the interest rate swap is used to calculate the interest payment and needn't be exchanged. Thus, it is called notional principal.
18. Swaps can be traded on any financial asset or liability. A lot of customized swaps are created for a wide variety of other assets and in a wide variety of combinations. Commodity swaps, equity swaps and swaptions are just part of them.

Key Terms

Amortizing loan (分期偿还贷款)
At-the-money (平值状态)
Call option (买入期权,看涨期权)
Chicago Board of Trade (芝加哥期货交易所)
Chicago Mercantile of Exchange (芝加哥商品交易所)
Commodity swap (商品互换)
Counter currency
(对等货币,指衍生产品中购买或出售标的货币时支付或换回的另一种货币)
Currency futures (货币期货)
Currency option (货币期权)
Currency swap (货币互换,货币掉期)
Default risk (违约风险)
Equity swap (权益互换)
Euronext (欧洲证券市场)
Financial derivatives (金融衍生产品)

Forward contract (远期合约)
Initial margin (初始保证金)
Interest rate swap (利率互换)
Intrinsic value (内在价值)
In-the-money (价内状态)
Margin account (保证金账户)
Margin call (追加保证金)
Maintenance margin (维持保证金)
Marking to market (逐日盯市)
New York Stock Exchange (NYSE) (纽约股票交易所)
Nonamortizing loan (到期一次付清贷款)
Option holder (期权持有人,期权买主)
Option premium (option price) (期权价格)
Option writer (期权出售者)
Out-of-the-money (价外状态)
Parallel loan (back-to-back loan) (平行贷款,背对背贷款)
Philadelphia Stock Exchange (PSE) (费城股票交易所)
Put option (卖出期权,看跌期权)
Reversing trade (反向交易)
Singapore International Monetary Exchange (SIMEX) (新加坡国际货币交易所)
Standardized contract (标准化合约)
Strike price (exercise price) (期权执行价)
Swaption (Swap option) (互换期权)
Time value (时间价值)
Underlying currency (标的货币)
Zero sum game (零和游戏)

Questions

1. What are financial derivatives? What is the main reason for the development and growth of financial derivatives?
2. How do currency forward and futures contracts differ with respect to maturity, settlement, and size and timing of cash flows?

3. Why are most futures contracts closed out through a reversing trade rather than held to delivery?
4. Explain the relationship between initial margin and maintenance margin?
5. How does a futures contract eliminate default risk?
6. What is the difference between a call option and a put option?
7. What are the differences between exchange-traded and over-the-counter currency options?
8. In what sense is a currency call option also a currency put option?
9. What determines the intrinsic value of an option? What determines the time value of an option?
10. What are the benefits to use currency options and what are the disadvantages for currency options?
11. What is a parallel loan? What are the pros and cons of a parallel loan?
12. How are swaps related to forward contracts? Discuss the basic motivations for a firm to enter into a currency swap.
13. What is a fixed-for-floating rate nonamortizing currency swap?
14. What is notional principal? What is the function of notional principal?
15. What is the difference between currency swap and interest rate swap?

CHAPTER 7
INTERNATIONAL FINANCIAL MARKETS

LEARNING OBJECTIVES

- Examine the basics of financial market including functions, characteristics and classifications
- Understand the international money market and popular instruments in this market
- Study the origins and development of the Eurocurrency market, the features and instruments of the market
- Explore the international capital market and compare the domestic bond, foreign bond, Eurobond and global bond
- Learn the basics of international equity market

In chapter 3 and chapter 6 we examined the foreign exchange market and derivatives markets. They are parts of the international financial markets. Firms and investors change one currency for another in foreign exchange markets. They use the derivatives markets to hedge foreign exchange risk exposure or interest rate risks. In this chapter we study other parts of the international financial markets: i. e. the nonderivatives markets. Due to astonishing growth in international trade and investment and reduction of barriers on capital movements, various international activities of banks (the so called "international banking") have evolved fairly rapidly during the past several decades. In addition to traditional international banking, new and initiated activities were initiated by a large number of international banks. As we know, access to cheapest capital in global market is one of the prerequisites

for a multinational corporation to maximize shareholders' wealth. Financing and investing in international financial markets are both technical and difficult. This is because international financial markets have different regulation, instruments, terminology and techniques. Those differences will have important consequences for risk, returns and the cost of doing business. Financial managers are required to have a thorough technical knowledge of the international money market, capital market and equity market, the financial instruments available on a particular market, trading practices, taxes and regulations in different financial markets and so on.

This chapter first introduces some basics of financial markets, the popular instruments in money market and capital market. We then discuss the most important international financial market: the Eurocurrency market and Eurobond market. We introduce the origin of the Eurocurrency and Eurobond markets, basic attributes of those two markets and several instruments available in those markets. Finally, we discuss the international equity market. This section mainly introduces world's major equity markets in both developed and developing countries, including the U. S., Japan, U. K. and emerging stock markets.

Introduction to Financial Market

Financial markets are markets for transactions of financial assets or liabilities. One party transfers funds in financial markets by purchasing financial assets previously held by another party. Financial markets facilitate the flow of funds and thereby facilitate financing and investing by households, firms, and government agencies. The markets and many of their different instruments vary by source of funding, pricing structure, maturity, and subordination or linkage to other debt and equity instruments. For example, stock exchanges trade company shares and government debt; the money market trades short-term loans and deposits; the foreign exchange market trades different currencies, specialized markets trade financial derivatives; the gold market is for buying and selling gold. The most important characteristic of a financial asset is its liquidity. **Liquidity** refers to the ease with which you can capture an asset's value. Liquid assets can be quickly converted into their cash

value.

There are many ways to categorize financial markets. **National financial market** is regarded as an internal market or domestic market because the financial assets or liabilities traded on this market are issued in the domestic currency; the trading practices follow the domestic conventions and are regulated by domestic authorities. **International financial market** refers to an external market where the financial contracts are placed outside of the borders of any single country and can be regulated by more than one country or by none at all. According to the maturities of the financial assets or liabilities, the financial market can be classified as money market and capital market. **Money market** is the market for trading financial assets and liabilities with maturities less than one year. The **capital market** trades financial contracts with maturities more than one year.

International Money Market

The typical money markets are foreign exchange market, bank, government, corporate notes and international commercial paper markets. Money markets facilitate the flow of short-term funds. The most important financial intermediary in money markets is the commercial bank. This is the case for almost every country. The instruments in the money markets have a relatively high degree of liquidity simply because they can be easily bought and sold. Most firms and financial institutions maintain some holdings of money market instruments for this reason. On the other hand, money market instruments tend to have a low expected return but also a low degree of risk. International money market can be classified as short-term credit market, short-term securities market and discount market.

Short-term Credit Market

Short-term credit market is basically an interbank market. It operates at the wholesale level. The market provides short-term loans with the maturities from one day to one year. The market is facilitated by electronic funds transfer systems. The interest rate charged are those offered by major banks to each other in the interbank market. Major newspapers publish those rates every day. The international money

market interest rates for some currencies are shown in **Exhibit 7.1**.

Exhibit 7.1 International money market interest rate quotations: July 29, 2011

	Short term	7 days notice	One month	Three month	Six month	One year
Euro	1.00 - 0.90	1.08 - 0.98	1.54 - 1.34	1.72 - 1.52	2.02 - 1.67	2.00 - 1.70
Danish Krone	1.50 - 1.30	1.40 - 1.20	1.51 - 1.25	1.72 - 1.22	1.85 - 1.35	2.15 - 1.96
Sterling	0.57 - 0.47	0.64 - 0.54	0.84 - 0.64	1.02 - 0.82	1.30 - 1.10	1.76 - 1.56
Swiss Franc	0.18 - 0.03	0.33 - 0.06	0.30 - 0.17	0.28 - 0.18	0.47 - 0.35	0.81 - 0.69
Canadian Dollar	1.15 - 0.85	1.15 - 0.87	1.17 - 0.90	1.33 - 1.18	1.88 - 1.35	2.05 - 1.70
U.S. Dollar	0.29 - 0.14	0.41 - 0.11	0.40 - 0.20	0.60 - 0.40	0.92 - 0.82	1.30 - 1.20
Japanese Yen	0.10 - 0.05	0.11 - 0.06	0.05 - 0.04	0.35 - 0.25	0.46 - 0.26	0.79 - 0.67
Singapore $	0.02 - 0.01	0.31 - 0.06	0.28 - 0.03	0.33 - 0.10	0.40 - 0.19	0.66 - 0.37

Note: Short term rates are call for the U.S. Dollar and Yen. Others: two days' notice
Source: *Financial Times* July 30, 2011

Short-term Securities Market

This is a market for transactions of various kinds of short-term securities. The main securities include treasury bill, commercial paper, negotiable certificate of deposit, repurchase agreement and bankers' acceptance.

Treasury bill is a government short-term debt instrument. The typical treasury bill is the U.S. Treasury bill which is sold weekly through an auction and represents about one-third of the government's outstanding negotiable debt. T-bills bear no formal interest, but are promised to pay on maturity date, issued at a discount on their par value (the face value). The maturities of T-bill are typically three-month, six-month and one-year. One-year T-bill is issued on a monthly basis. The par value of the T-bill is \$1,000 and in multiples of \$1,000 thereafter. T-bills are regarded as highly liquid financial assets because of their short maturity and strong secondary market.

Commercial paper is an unsecured, short-term debt issued only by a well-known creditworthy corporation. It is usually issued at a discount. Commercial paper is often regarded as a reasonable substitute for Treasury bills, certificates of deposit, etc. The minimum denomination of commercial paper is usually \$100,000. Most commercial papers are in multiples of \$1 million

denominations. Small investors can only invest in commercial paper indirectly through money market funds. Maturities are normally between 20 and 45 days but can be as short as one day or as long as 270 days. In most cases, commercial paper is held until maturity by investors. For the most part, commercial paper is a very safe investment because the financial situation of a company can easily be predicted over a few months.

Negotiable Certificate of deposit (NCD) is generally issued by large commercial banks and other depository institutions with a minimum face value of $100,000. NCDs are bought most often by large institutional investors. Institutions often use these as a way to invest in a low-risk, low interest security. Maturities on NCDs range from two weeks to one year. Since NCDs are guaranteed by the bank, they can usually be sold in a secondary market, providing investors with some liquidity.

Repurchase agreement is usually called repo. A dealer or holder of government securities (usually T-bills) sells the securities to a lender and agrees to repurchase them at an agreed future date at an agreed price. They are usually very short-term, from overnight to 30 days or more. A repo is like a loan backed by the securities. If the borrower defaults on the loan, the lender has claim to the securities. There are also variations on standard repos. A **reverse repo** is the complete opposite of a repo. In this case, a dealer buys government securities from an investor and then sells them back at a later date for a higher price. A **term repo** is exactly the same as a repo except the term of the loan is more than 30 days. Repos are popular because they can virtually eliminate default risk.

Banker's Acceptance is a short-term credit instrument created by a non-financial firm and guaranteed by a bank to make a payment. It is a form of promissory note, commonly used in international trade. If an exporter does not know an importer's credit standing, he usually prefers that a bank should act as a guarantor. In other words, a time draft issued by the importer must be accepted by a bank. If a bank stamps "ACCEPTED" on the time draft, he obligates payment at a specified point in time. Exporters who hold acceptance usually sell it at discounts in the secondary market to obtain cash immediately.

Discount Market

Discount is a reduction from a bill of exchange or other drafts when it is

purchased before its maturity date. The party that purchases (discounts) the bill pays less than its face value and therefore makes a profit when it matures. Discount market consists of banks, discount houses, and bill brokers. The discount houses primarily operate in the United Kingdom. They buy, sell and discount bill of exchanges, promissory notes. This is generally performed on a large scale with transactions that also include government bonds and treasury bills. Commercial banks or discount houses can rediscount a short-term negotiable debt instrument at the central bank's discount window. When there is low liquidity in the market, banks or discount houses can generate cash by rediscounting drafts.

Eurocurrency Market

The most important international money market is the Eurocurrency market which is a market for transactions of financial assets and liabilities denominated in Eurocurrencies. The banks dealing in Eurocurrencies are called Eurobanks. A **Eurocurrency** is a currency held in a country other than the country the currency is issued. For example, a U. S. dollar deposit held in London or Paris or some other countries other than the United States is a Eurodollar deposit. A Japanese yen loan in Zurich is a Euroyen loan. The use of the prefix Euro is somewhat misleading because it does not necessarily mean that those currencies must be held in a European country. A Eurocurrency actually means an "offshore" currency.

Eurodollar is the most important Eurocurrency which accounts for approximately 60 – 65% of all Eurocurrency activity, followed by the Euroeuro, EuroSwissfranc, Eurosterling and Euroyen.

Eurocurrencies are generally in the form of variable-rate time deposits with maturities of less than one year. So the Eurocurrency market is part of the international money market. The participants in the Eurocurrency market are governments, financial institutions, MNCs and international institutions such as IMF, World Bank and European Investment Bank as well as private investors. Developed countries act both lenders and borrowers of funds, while many less-developed countries are borrowers in this market.

Brief History of the Eurocurrency Market

The Eurocurrency originated from the Eurodollar. As tension between the U.S. and the former Soviet Union increased during the Cold War in 1950s, the Russian feared that U.S. might freeze Soviet Union's funds in U.S. banks. Therefore, they moved the funds to banks in Paris and London. These dollar deposits were the first Eurodollars.

The main reason for the Eurodollar market to prosper was the increased regulation of domestic banking activities by the U.S. authorities. **Regulation Q** introduced in 1963 by the Federal Reserve Bank imposed a 5.25% ceiling on the rate of interest that U.S. banks could pay on savings and time-deposit accounts. European banks were not subject to this regulation and, consequently, could pay higher rates for dollar deposits than U.S. banks. This induced American banks to set up overseas branches to take these dollar deposits. In the same year, the **Interest Equalization Tax** (IET) was introduced to discourage non-residents from borrowing in the United States. It was a tax on U.S. residents' earnings on foreign securities. To compensate for the tax, foreign borrowers were obliged to pay higher interest rates, which raised the cost to foreigners of borrowing dollars in U.S. The IET led foreign borrowers to borrow funds on the Eurodollar market. A further measure to discourage U.S. banks from lending to non-residents was the **Voluntary Foreign Credit Restraint Guidelines** which were issued in 1965 and became mandatory in 1968. The Guidelines were restrictions placed on non-domestic uses of domestically generated funds. Under these restrictions, many U.S. firms with plans for overseas projects simply shifted their financing needs to the Eurodollar market.

There were other reasons for the rapid growth of the Eurocurrency market. After 1973 oil crisis the OPEC countries deposited large amounts of dollars on the Eurodollar markets. Oil-importing countries, on the other hand, faced huge BOP deficit problems, and they needed funds to finance their deficits. Eurodollar markets thus played an important intermediary role in recycling funds from the surplus OPEC countries to the deficit oil importing countries. In 1970s and the early 1980s, many developing countries borrowed funds in the Eurocurrency market. Rapid growth of world trade also contributes to the development of the Eurocurrency market. More companies have excess working balances in a foreign currency on which they seek high rates of return, while

others require short-term borrowing facilities at competitive rates of interest.

Credit Expansion through the Eurocurrency Markets

The following example shows how the Eurocurrency market works. Suppose that a Chinese exporter sells $1 million of merchandise to an American firm. The American importer pays for the purchase by drawing a $1 million check on his checking account in Bank of America, New York. The Chinese exporter deposits the check in a time deposit in HSBC Hong Kong Branch. Here HSBC Hong Kong Branch is a eurobank because it takes U.S. dollar deposit. The above two transactions are shown in **Exhibit 7.2.**

Exhibit 7.2 Transfer of U.S. dollar from a U.S. bank to a eurobank

Bank of America		HSBC (eurobank)	
Assets	Liabilities	Assets	Liabilities
	− $1 million deposit of U.S. company	+ $1 million deposit at Bank of America	+ $1 million deposit of Chinese firm
	+ $1 million deposit of HSBC		

From the U.S. perspective, ownership of $1 million demand deposits has been transferred from the U.S. importing company to a eurobank, the HSBC Hong Kong Branch, but the U.S. banking system is not affected because the $1 million still remains in the United States. $1 million Eurodollar is created in Hong Kong. The reason is that the deposit in Hong Kong exists in addition to the dollars deposited in U.S.

Now assume that HSBC Hong Kong Branch makes $1 million loan to a local firm. The firm deposits the proceeds of the loan in Bank of China, Hong Kong Branch. The transactions are shown in **exhibit 7.3.**

Exhibit 7.3 Loan by HSBC to a local firm

Bank of America		HSBC		Bank of China	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
	$1 million deposit of HSBC	− $1 million deposit at Bank of America		+1 million deposit at Bank of America	+1 million deposit of local firm
	+ $1 million deposit of Bank of China	+ $1 million loan to local firm			

There are now $ 2 million worth of Eurodollars in the system. The whole process could be restarted as long as the funds are redeposited with another eurobank. If the local firm uses the funds to pay various bills due or finance a project instead, $ 1 million will eventually injected into the American economy and thereby returned to the U. S. banking system. Therefore, no more Eurodollars will be created.

This is a highly simplified example of the way the Eurobanking system creates credit. In reality, leakages occur in the above process like we mentioned. Another example that dollars can "leak" from the Eurobanking system is the sale of dollars for another currency. In the above example, if the Chinese exporter sells dollars to HSBC for RMB, the dollars are most likely to "leak" from the system.

Characteristics of the Eurocurrency Market

Since Eurocurrency transactions are outside the jurisdiction of any single country, they are not subject to the rules that governmental agencies impose on national credit markets. This allows the Eurocurrency markets to avoid domestic interest rate regulations, reserve requirements, and other barriers to free flow of capital. The banks on the Eurocurrency market are not required to hold reserve assets. This gives them a competitive advantage over domestic banks which are required to hold part of their assets in the central bank to meet official reserve requirements. The banks on the Eurocurrency market are then able to hold less money in the form of low-interest reserves enabling them to pay a higher interest rate on deposits and charge a lower rate on loans. Corporations and financial institutions with access to the Eurocurrency market can typically obtain lower cost funds or store funds at higher interest rates than in domestic credit markets.

About 50% of Eurocurrency transactions occur through London banks. Consequently, the London Inter Bank Bid Rate and Offer Rate are the most frequently quoted rates. The bid rate is what a Eurocurrency bank is willing to pay its customers and the offer rate is the bank demands for making a loan. The difference of the bid and ask is called interbank spread and is typically one-eighth percent for large interbank transactions in major currencies. For corporations and investors, the spread of the bid and ask is a little bit larger but

it is still very small compared to many domestic market practices. **Exhibit 7.4** shows some LIBOR for major currencies reported in the *Financial Times*.

Exhibit 7.4 LIBOR for major currencies

	Over night	One month	Three month	Six month	One year
U.S. $	0.13125	0.19110	0.25550	0.43025	0.76025
Euro	0.94500	1.37875	1.55688	1.80138	2.16938
Sterling	0.57125	0.63188	0.83281	1.11500	1.58781
Swiss Franc	0.07167	0.12583	0.17500	0.24167	0.52867
Yen	0.10594	0.14031	0.19531	0.34031	0.55938
Canadan $	0.99667	1.08000	1.18000	1.35500	1.85333

Source: *Financial Times* July 29, 2011

One of the interesting characteristics of the structure of loans and deposits in the Eurocurrency market is that they are predominately of a short-term nature with some deposits being as short as one day (overnight loan) and the vast majority under six months. Furthermore, there is a close matching of the maturity structure of deposits and loans; typically if money is taken in for three months then it will be loaned out for three months. It is said the close matching of deposits and loans can reduce risks to the banks due to interest rate fluctuations.

Instruments in Eurocurrency Market

Eurocredit or Euroloan refers to a short- and medium-term bank loan denominated in Eurocurrency to corporations, sovereign governments, or international organization. Most eurocredits are Eurodollar loans with the interest rate tied to the LIBOR. One of the features of a eurocredit is that it can be mobilized quickly and easily. The documentation is standardized and simple and there is no waiting list to respect as there is in the Eurobond market. For example, the whole procedure takes only four to six weeks. The terms of a eurocredit can be tailored to the borrower's specific needs. For example, standby credits make it possible for borrowers to mobilize a large loan just in case they need it. If they need to use it, they pay the interest and commissions just as they would on a normal loan. If they do not use it, they only pay the

commissions and perhaps a small fee.

Eurocommercial paper (ECP) is an unsecured, short-term debt obligation issued at a discount by a bank or corporation in Eurocurrency market, denominated in a currency that differs from the corporation's domestic currency. Maturities are usually one, three and six months. Most Eurocommercial papers are denominated in U.S. dollars. There are a number of differences between the U.S. and Eurocommercial paper markets. The maturity of Eurocommercial paper tends to be about twice as long as U.S. commercial paper. For this reason, the secondary market for large-denomination Eurocurrency certificates of deposit (CDs) with face value of $ 100,000 and up is more active than for U.S. commercial paper.

Floating rate notes (FRNs) are medium-term bonds that pay investors a regular interest linked to short-term interest rates like three or six month LIBOR. Sometimes the asset and liability maturities of eurobanks do not match. This can adversely affect a bank's performance during periods of rising interest rates, since it may have locked in a rate on its Eurocredit loans while its rate paid on short-term deposits is rising over time. To avoid this risk, eurobanks now sell commonly floating rate notes. Some FRNs guarantee a minimum interest rate. This can suit investor and issuer alike. The cost of issuance is key to the borrower.

Syndicated credit or **syndicated loan** is a loan offered by a group of lenders (called syndicate) who work together to provide funds for a single borrower. The borrower could be an MNC, a local or national government, an international organization. The loan may involve fixed amounts, a credit line, or a combination of the two. A syndicated credit is arranged by a lead bank (also called lead manager) on behalf of its client. When a large company needs large amounts of capital, it deals with a lead bank. The lead bank seeks the participation of a group of banks, with each participant providing a portion of the total funds needed. This lead bank may be putting up a proportionally bigger share of the loan, or perform duties like dispersing cash flows amongst the other group members or administrative tasks. The main goal of a syndicated loan is to spread the risk of a borrower default across multiple lenders (such as banks) or institutional investors like pension funds or hedge funds. Because syndicated loans tend to be much larger than standard bank loans, the risk of

even one borrower defaulting could cripple a single lender. Borrowers who receive a syndicated loan incur various fees besides the interest on the loan. For example, **front-end fees** are paid to represent the costs of organizing the syndicate and underwriting the loan; **commitment fee** is charged annually on the unused portion of the available credit extended by the syndicate. Syndicated loans are also used in the leveraged buyout community to fund large corporate takeovers with primarily debt funding. The syndicated loan is also known as "syndicated bank facility".

International Capital Market

Capital market is the market for trading financial assets and liabilities with maturities greater than one year such as bonds, mortgages, and stocks. Capital markets facilitate the flow of long-term funds. We focus our discussion mainly on the bond market in this section.

Bonds are bought and sold in enormous quantities every day. The trading volume in bonds on a typical day is many, many times larger than the trading volume in stocks. Publicly traded bonds are an important source of capital for companies and governments. **Exhibit 7.5 and 7.6** display the two most important publicly traded debts in selected countries or regions.

Exhibit 7.5 Domestic debt securities by issuers* for selected countries
In billions of U.S. dollars

Country	2008	2009	2010
United States	24,567.2	24,965.8	25,096.3
Japan	11,052.1	11,521.5	13,275.1
France	2,885.4	3,146.0	3,198.5
Italy	2,813.0	3,191.0	3,077.0
Germany	2,592.8	2,806.7	2,710.5
China	2,209.5	2,565.4	2,969.1
United Kingdom	1,219.3	1,548.8	1,679.8
Canada	1,033.9	1,304.3	1,388.5

* Issuers include governments, financial institutions, and corporate issuers
Source: BIS Quarterly Review, June 2011

Exhibit 7.6 International bonds and notes-all issuers*

By region of issuers

Amounts outstanding in billions of U.S. dollars

	December 2009	December 2010	March 2011
Developed countries	26,061.2	26,772.2	28,063.6
Offshore centers	243.3	256.8	250.2
Developing countries	1,326 1	1,531.4	1,620.0
Inter organizations	792.4	881.9	958.4

* Issuers include governments, financial institutions, and corporate issuers

Source: BIS Quarterly Review, June 2011

One reason the bond markets are so big is that the number of bond issues far exceeds the number of stock issues. There are two reasons for this. First, a corporation would typically have only one common stock issue outstanding. However, a single large corporation could easily have a dozen or more note and bond issues outstanding. Beyond this, federal, state, and local borrowing is simply enormous. For example, even a small city would usually have a wide variety of notes and bonds outstanding, representing money borrowed to pay for things like roads, sewers, and schools. There are thousands of cities in a country. Thus it is not difficult to imagine why the bond markets are so big.

The classification of a bond depends on its type of issuer, priority, coupon rate and redemption features. Here we just discuss domestic bonds and international bonds. International bonds can also be classified as foreign bonds, Eurobonds and global bonds.

Domestic bonds are issued by a domestic borrower, traded within the domestic market, and denominated in the domestic currency. Domestic bonds are regulated by the domestic government and are traded according to local conventions. For example, in the United States, government bonds are traded in an over-the-counter (OTC) market through commercial and investment banks. Corporate bonds are traded over the counter by commercial banks as well as on the bond-trading floor of the New York Stock Exchange.

If the name of the bond owner is printed on the bond, it is a **registered bond**. Corporate and government bonds in Canada, Japan, and U.S. are issued as registered bonds. In countries requiring that bonds be issued in registered

form, each issuer maintains a record of the owners of its bonds and directly sends interest of the bonds to the owners. Registered bonds typically pay quarterly or semiannual interest.

The convention in European countries is to use bearer bonds. **Bearer bonds** are not registered and can be redeemed by the holder. The holder of the bearer bonds is required to clip coupons attached to the bonds and send them to the issuer to receive coupon payments. The principle advantage of bearer bonds is that they retain the anonymity of the bondholder. Bearer bonds are usually issued with annual coupons.

Bonds are sold at a discount meaning the bond's selling price is less than its face value. So if a bond is initially priced at 95 percent of par, the bond's initial price is $95. The price of a bond is determined by the prevailing interest rates on other similar financial assets and the time to maturity of the bond.

International bonds include foreign bonds, Eurobonds and global bonds.

Foreign bonds are issued in domestic market by a foreign borrower, denominated in domestic currency, marketed to domestic residents, and regulated by domestic authorities. For example, a Chinese company issues dollar denominated bonds in America. This is foreign bonds in the eyes of Americans. The bonds must meet the security regulations of the United States and must be registered with the Securities and Exchange Commission (SEC). The Chinese company must also provide a prospectus disclosing detailed financial information to the prospective investors. There are special names for foreign bonds in some countries. For example, foreign bonds are known as Yankee bonds in the United States, Bulldog bonds in the United Kingdom, Samurai bonds in Japan, Panda bonds in China and so on.

Eurobonds are denominated in a currency different from the country where the bond is issued. For example, a dollar denominated bond sold outside the border of the U.S. is a Eurobond or dollar Eurobond. A sterling bond sold in Japan is a sterling Eurobond. Eurobonds are bearer bonds, and the interest payments are free of withholding taxes. They are thus attractive to investors wishing to remain anonymous, for tax avoidance or other reasons.

Global bonds are bonds that can be offered within the Eurocurrency market as well as several other markets simultaneously. Unlike Eurobonds, global bonds can be issued in the same currency as the country of issuance. For example, a global

bond could be both issued in the United States and denominated in U. S. dollars. Usually, borrowers must be large investment-grade borrowers and must borrow in actively traded currencies. Global bond offerings enlarge the borrower's opportunities for financing at reduced costs. Purchasers desire the increased liquidity of the issues and have been willing to accept lower yields.

Eurobond Markets

Introduciton to Eurobond Market

A Eurobond is a bond issued in a currency other than that of the country or market to which it is issued; i. e. a bond composed of claims in a particular currency but held outside the country of that currency. Eurobonds are identical in principle to Eurocurrencies and arose out of the Eurocurrency market. Eurobond market is part of the international capital market. The Eurobond segment of the international bond market accounts for approximately 80 percent of new offerings. As with many financial innovations, the Eurobond market was born and matured as borrowers and investors sought ways to circumvent government restrictions on cross-border capital flows.

The first Eurobond was issued in 1963. The Interest Equalization Tax in 1963 required the U. S. citizens who held dollar bonds issued by foreign entities in the United States pay taxes to the federal government. The purpose of the IET was to protect the balance of payments from excessive capital outflows and to preserve the scarce long-term capital supplied by domestic savers. Foreign borrowers began to issue U. S. dollar bonds outside of the United States. A further incentive for the growth of the Eurobond market was an interest withholding tax that was imposed on domestic U. S. bonds held by foreigners. The interest withholding tax made it inconvenient for foreign investors to own dollar-denominated bonds. Eurobonds that were not subject to taxation by the U. S. government were an attractive alternative for foreign investors wishing to avoid the interest withholding tax.

Although the IET was abolished in 1974 and withholding tax removed in 1984, the Eurobond market continued to prosper. Several thousand Eurobond issues now trade in the secondary market.

If a borrower needs to raise funds by issuing Eurobonds to the investors, he

will usually contact an investment banker who is usually the lead manager of an underwriting syndicate. The **underwriting syndicate** is a group of investment banks, merchant banks and commercial banks that specialize in some phase of a public issuance. The group serves as an underwriter for the bond issue, that is, the **underwriter** will buy the bonds from the borrower at a discount from the issuing price. The bonds are then resold to other investors in the secondary market by the underwriter. The secondary market for Eurobonds is an over-the-counter market with principal trading in London.

The Eurobond market is constantly evolving and innovating to meet the changing preferences of both borrowers and investors of funds. Today Eurobonds come in a huge variety of different forms varying in the credit rating of the issuer, the maturity of the issue, the liquidity of the secondary market, the currency of denomination, whether of a fixed or variable rates and in specific features. This makes comparing different Eurobonds a complex issue.

Features of the Eurobond

Eurobond sales fall outside the regulatory domain of any single nation. Therefore, Eurobonds are generally exempt from the rules and regulations that govern the issue of foreign bonds in a country; Take for example, the need to issue very detailed prospectuses and withholding taxes.

Vast majority of the Eurobonds are "straight" bonds which pay fixed interest rate with repayment of principal upon maturity. During the life of the bond, fixed coupon payments, which are a percentage of the face value, are paid as interest to the bondholders. In contrast to many domestic bonds, which make semiannual coupon payments, coupon interest on Eurobonds is typically paid annually. The vast majority of new Eurobond offerings are straight fixed-rate issues. The U. S. dollar and Euro have been the most common currencies denominating straight fixed-rate bonds in recent years.

Increasingly popular are floating-rate notes (FRNs) which are Eurobonds on which the interest rate is adjusted every three to six months in line with changes in a key interest rate such as LIBOR. Floating-rate notes are typically medium-term bonds. Coupon payments on FRNs are usually quarterly or semiannual and in accord with the reference rate. If an investor needs to preserve the principal value of the investment when he likes to liquidate the

investment prior to the maturity of the bonds, the FRNs are a good choice. FRNs are the second most common type of Eurobond issue.

Equity-linked bonds are associated with the right to acquire equity stock in the issuing company. Some have detachable warrants containing the acquisition rights, while others are directly convertible into a specified number of shares. Equity-linked bonds usually pay a below-market rate of interest with holders attracted by the potential gain on the possibility of a share price conversion.

Eurobonds have shorter maturities than other bonds on domestic markets. The majority of Eurobonds have maturities from four to seven years. Therefore, the Eurobond market is primarily a medium-term borrowing market.

Eurobonds are issued in bearer form, meaning that the name and country of residence of the owner is not on the certificate. The anonymity is one of the attractions to international investors who like to avoid open registration of their ownership. Bearer bonds are also tied to tax avoidance. Further more, Eurobonds are free of withholding taxes and Eurobonds interest is not always reported to tax authorities.

International Stock Market

Stocks are issued by firms that raise long-term funds. Stocks are purchased by investors that want to invest long-term funds and obtain partial ownership in firms. Stock markets are for trading company equities and derivatives at an agreed price. MNCs and domestic firms usually obtain long-term funding by issuing stock locally. They can also raise funds to float stock issues in international stock markets. The world capital markets experienced greater global integration during the last several decades. In recent years, many firms have obtained funds from foreign markets through international stock offerings. Two reasons can explain that firms decide to issue their stocks overseas. First, a firm can increase public awareness of the company and its products through international stock offerings. The name recognition of the company established in a new capital market paves the way for the firm to source new equity or debt capital from local investors as demands dictate. Second, having its stocks listed on foreign exchanges expands the investor base

for the firm's stock, thus potentially increasing the market price of its stock because of increased demand. Additionally, greater market demand and a broader investor base improve the price liquidity of the stock.

The performance of all the world's stock markets is directly responsible for a significant amount of the world's economic condition — whether it be healthy, ailing, or trending sideways. In general, stock market growth is a leading indicator that the state of an economy is flourishing, while declining trends indicate of economic slowdown. For instance, rising stock prices tend to be associated with increased business investment and vice versa. Stock prices also affect the wealth of households and their consumption. Some commentators and economists suggest that stock markets often predict what will happen in the economy of that country around six months later.

We introduce four major stock markets in the world in this section, that is: the United States stock market, the Japanese stock market, the United Kingdom stock market and the emerging markets. **Exhibit 7.7** provides a summary of the world's major stock exchanges. Numerous other exchanges also exist. Stock markets in different countries differ in many ways. Their structures, trading practices, listing requirements, tax treatments and regulatory systems are all different. The United States has by far the largest equity market, with a total market capitalization of about \$20 trillion at the end of 2010. Japan was second at \$3.8 trillion and the United Kingdom was third at \$3.6 trillion. The list includes several emerging equity markets such as China, India, Brazil and Russia. China is the world's fourth largest equity market, with a total market capitalization of about \$3 trillion at the end of 2010. The new stock markets in emerging economies enable foreign firms doing business in those countries to raise large amounts of capital by issuing stock there.

Exhibit 7.7 Major stock exchanges in the world: Year ended December 31, 2010

Rank	Country (region)	Stock Exchange	Market Capitalization (billions \$)	Trade value (billions \$)
1	U.S. and Europe	NYSE Euronext	15,970	19,813
2	U.S. and Europe	NASDAQ OMX	4,931	13,439
3	Japan	Tokyo Stock Exchange	3,827	3,787

Continued

Rank	Country (region)	Stock Exchange	Market Capitalization (billions $)	Trade value (billions $)
4	United Kingdom	London Stock Exchange	3,613	2,741
5	China	Shanghai Stock Exchange	2,717	4,496
6	Hong Kong	Hong Kong Stock Exchange	2,711	1,496
7	Canada	Toronto Stock Exchange	2,170	1,368
8	India	Bombay Stock Exchange	1,631	258
9	India	National Stock Exchange of India	1,596	801
10	Brazil	BM&F Bovespa	1,545	868
11	Australia	Australian Securities Exchange	1,454	1,062
12	Germany	Deutsche Borse	1,429	1,628
13	China	Shenzhen Stock Exchange	1,311	3,572
14	Switzerland	SIX Swiss Exchange	1,229	788
15	Spain	BME Spanish Exchanges	1,171	1,360
16	South Korea	Korea Exchange	1,091	1,607
17	Russia	MICEX	949	408
18	South Africa	JSE Limited	925	340

Source: http://en.wikipedia.org/wiki/List_of_stock_exchanges

U.S. Stock Markets

The U.S. stock markets are composed of several main stock exchanges: the New York Stock Exchange (NYSE), the NASDAQ, the American Stock Exchange (AMEX) and other smaller exchanges.

New York Stock Exchange was merged with Euronext in 2007. It is the largest stock exchange in the world with approximately 8,000 listed issues from more than 55 countries. NYSE Euronext is a listed exchange where a lot of trading is done face-to-face on the trading floor. The flow of an order starts first at the brokerage firm, then down to the broker on the floor. The broker is

also known as the specialist, and they match the buyers and sellers of a given stock. At the time of the actual sale the price is determined via auction where the current price is the greatest amount a buyer is willing to pay and the lowest price at which one is willing to sell. The main index tracking the NYSE Euronext is the Dow Jones industrial average index.

National Association of Securities Dealers Automated Quotations System (NASDAQ) is the largest electronic screen-based equity securities trading market in the United States and second largest by market capitalization in the world. It is a virtual stock exchange, referred to as an over-the-counter or OTC market. There is no physical location for the NASDAQ, nor are there floor brokers on the NASDAQ. All stock trades are done electronically through a network of dealers. Typically, smaller firms and firms that do not meet the membership requirements for trading in the agency markets trade in the OTC market. NASDAQ composite index is the index measuring the average performance of the stocks listed in the exchange.

In addition, there are several smaller regional exchanges in the U. S, most notably the American Stock Exchange (AMEX), the Pacific Exchange and the Philadelphia Stock Exchange. Their listing requirements are less stringent than those of the NYSE Euronext and they encourage the registration of new companies as well as foreign ones.

The U. S. investment banks commonly serve as underwriters of the stock targeted for the U. S. market. Non-U. S. firms are able to place an entire stock offering within the U. S. They also obtain equity financing by using **American depository receipts (ADRs)**, which are negotiable certificates issued by U. S. banks representing a specified number of shares in foreign stocks that are traded on U. S. exchanges. The bank holds the foreign stocks in its vault for its customers. The bank also serves as the transfer agent for the ADRs. ADRs help to reduce administration and duty costs that would otherwise be levied on each transaction. U. S. and non-U. S. investors can invest in ADRs.

Japanese Stock Markets

The main stock exchanges in Japan are Tokyo Stock Exchange (TSE) and the Osaka Securities Exchange (OSE). Smaller stock exchanges operate in Nagoya and Hiroshima. TSE is the largest stock exchange in Japan. Stocks listed

on the TSE are separated into the First Section for large companies, the Second Section for mid-sized companies and Mothers Section for high-growth startup companies. New public issues in Japan must be approved by the Japanese Ministry of Finance. The Japanese government takes an active role in determining which companies are allowed to issue securities to the Japanese market and in regulating trade in these issues. The main indices tracking TSE are Nikkei 225 index, TOPIX index and J30 index. The Osaka Securities Exchange, on the other hand, mainly deals with derivative products. The Nikkei 225 Futures, introduced at OSE, is now an internationally recognized futures index.

U.K. Stock Markets

The London Stock Exchange (LSE) is the biggest equity market in Europe. One of the characteristics of the LSE is its internationalization. Over 60% of equity trading is the cross-border trading. It is also called the most international stock exchange. Trading in LSE was computerized by the so-called "Big Bang" in 1986. The "**Big Bang** " was the reform of British financial system in 1986. The major changes in LSE enacted on October 27, 1986 included the abolition of fixed commission rates charged by stockbrokers to their clients and the abolition of LSE rules enforcing a dual-capacity system. Since 1986 the Big Bang has also been associated with the globalization and modernization of the London securities market. Now trading on the LSE is computerized under the Stock Exchange Automated Quotations (SEAQ) system. Member firms are allowed to act as brokers or as dealers on their own account. The FTSE 100 and FTSE All Shares 750 indices are major indices tracking U.K. equities. The LSE plays a special role in international finance because of London's role as an international center for currency and Eurocurrency trading.

Emerging Equity Markets

An emerging equity market is a stock market from a developing country. According to the International Finance Corporation, a developing country is one that has either a low ($725 or less per capita in 1994) or middle ($726 - $8,955) income.[①] Many emerging markets have grown significantly since

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① International Finance Corporation: "Emerging Stock Markets Factbook, 1996"

1980's as investors became aware of the benefits of international portfolio diversification. In Asia, China and India have become the world's fourth and seventh largest equity markets respectively. Other Asian countries such as Korea, Malaysia, Indonesia the Philippines and Turkey etc. are all important emerging equity markets. Stock markets in Eastern and Central Europe, Africa, Latin America and Asia are, with few exceptions, still in their infancy. Wide disparities across countries still exist. Some countries have strict restrictions on foreign stock market participation and repatriation of income and capital. Others have no restrictions.

Summary

1. Financial markets are markets for transactions of financial assets and liabilities. They can be categorized according to different standards. The international money market is the market for short-term — usually less than a year — financial assets and liabilities. The capital market is the market for long-term — more than one year — financial assets and liabilities. The bond market is the most important source of capital for companies and governments.
2. Financial market provides liquidity. Liquidity refers to the ease with which you can capture an asset's value. Liquid assets can be quickly converted into their cash value.
3. International money markets are composed of short-term credit market, short-term securities market and discount market. The main instruments in international money markets include international bank credits, treasury bills, commercial papers, and negotiable certificates of deposits (NCDs), repos and banker's acceptance.
4. The Eurocurrency market is a typical international money market in which Eurocurrency, currency held in banks outside of the country where it is issued, is borrowed and lent by banks, corporations, governments and investors.
5. Eurocredit, Eurocommercial paper, floating rate notes, and syndicated credits are just part of the financial instruments traded on the Eurocurrency market.

6. The growth and development of the Eurocurrency market come down to the increased regulation on domestic banking practices by U. S. authorities, OPEC countries' excess dollars and oil-importing countries' huge BOP deficits, and the rapid growth of international trade and investment.
7. The characteristics of Eurocurrency market are absence of regulatory interference, narrow spread of the bid and ask price of a loan and short-term nature of the loans in this market.
8. Bond market is the most important capital market. Bonds can be categorized according to the type of issuer, priority, coupon rate and redemption features. Domestic bonds and international bonds are classified according to the type of issuer. Domestic bonds are issued by domestic residents, while international bonds are issued by foreign residents.
9. There are three types of international bonds: foreign bond, Eurobond and global bond. Foreign bonds are issued in domestic market by a foreign borrower, denominated in domestic currency, marketed to domestic residents, and regulated by domestic authorities. Eurobonds are denominated in a currency different from the country where the bonds are issued. Global bonds are bonds that can be offered within the Eurocurrency market as well as several other markets simultaneously.
10. Eurobonds are issued in countries other than the one in whose currency they are denominated. They are not traded on a particular national bond market and, therefore, are not regulated by any domestic authority.
11. The Eurobond market is a major source of finance for top quality borrowers such as governments and government agencies of developed countries, international organizations, banks from developed countries and large corporations from developed countries.
12. The advantages to international equity issues are: Issuing internationally makes it possible to issue in larger amounts; it increases and diversifies the shareholder base; it improves the firm's image; it often offers less constraining listing procedures; and the secondary market on international issues is active and liquid, especially on the major international exchanges such as London and New York.
13. For investors, international equities offer the benefits of portfolio diversification and the possibility of favorable tax treatment.

14. The United States, Japan and the United Kingdom are the three major equity markets in the world. The three markets are different in many ways. The stock markets in emerging economies have experienced astonishing growth rate. They have become more and more important for investors all over the world.

Key Terms

American depository receipts (ADRs) (美国存股证)
Banker's acceptance (银行承兑汇票)
Bearer bond (不记名债券)
Big Bang (大爆炸金融改革)
Bulldog bond (斗牛犬债券)
Capital market (资本市场)
Commercial paper (商业票据)
Commitment fee (保证费用)
Discount market (贴现市场)
Discount house (贴现所)
Domestic bond (国内债券)
Emerging equity markets (新兴资产市场)
Equity-linked bonds (可转换股份债券)
Eurobank (经营欧洲货币的银行)
Eurobond (欧洲债券)
Eurocredit (Euroloan) (欧洲信贷,欧洲货币贷款)
Eurocurrency (欧洲货币)/离岸货币
Eurodollar (欧洲美元)
Floating rate notes (FRNs) (浮动利率债券)
Foreign bond (外国债券)
Front-end fees (先付费用)
Global bond (全球债券)
Interest equalization tax (利息平衡税)
International bond (国际债券)
International financial market (external market) (国际金融市场,外部市场)
International Money Market (国际货币市场)

Lead bank (lead manager) (牵头银行)
LIBOR (伦敦同业银行拆借利率)
Liquidity (流动性)
National Association of Securities Dealers Automated Quotations System (NASDAQ) (全国证券交易商协会自动报价系统)
National financial market (domestic market, internal market) (国内金融市场)
Negotiable certificate of deposits (NCDs) (可转让存单)
Osaka Securities Exchange (大板证券交易所)
Panda bond (熊猫债券)
Registered bond (记名债券)
Regulation Q (Q 字条例)
Repurchase agreement (Repo) (回购协议)
Reverse repo (反向回购协议)
Samurai bond (武士债券)
Short-term credit market (短期信贷市场)
Short-term securities market (短期证券市场)
Straight bond (一般债券)
Syndicated credit (syndicated loan) (辛迪加贷款)
Term repo (限期回购协议)
Tokyo Stock Exchange (东京股票交易所)
Treasury bill (国库券)
Treasury bond (政府债券)
Underwriter (证券承销商)
Underwriting syndicate (承销辛迪加)
Voluntary foreign credit restraint guidelines (自愿限制外国信贷准则)
Yankee bond (扬基债券)

Questions

1. What is the difference between a money market and a capital market?
2. Define liquidity.
3. What are the components of international money market?
4. What is the difference between the repo and banker's acceptance?
5. What is the most common type of U.S. Treasury debt?

6. What are the characteristics of a domestic bond? An international bond? A foreign bond? A Eurobond? A global bond?
7. How does a Eurobond differ from a foreign bond? Why do Eurobonds make up the lion's share of the international bond market?
8. What are the benefits and drawbacks of offering securities in bearer form relative to registered form?
9. Why are Euroloans attractive to borrowers?
10. What is a Eurocurrency? How did the Eurocurrency market develop?
11. What is a syndicated loan? What is its purpose?
12. Why can the Eurocurrency markets offer more attractive borrowing and lending rates than the domestic markets for the same currencies?
13. Discuss any benefits you can think of for a company to issue its stock on more than one national exchange, and to source new equity capital from foreign investors as well as domestic investors.
14. What are ADRs? Why might it be easier for an investor desiring to diversify his portfolio internationally to buy depository receipts rather than the actual shares of the company?
15. Discuss any benefits you can think of for a company to (a) cross-list its equity shares on more than one national exchange, and (b) to source new equity capital from foreign investors as well as domestic investors.

CHAPTER 8
THE BALANCE-OF-PAYMENTS ADJUSTMENT (1)

LEARNING OBJECTIVES

- Examine the elasticity approach to the balance of payments
- Discover the effects of devaluation (depreciation) on BOP
- Understand Marshall-Lerner condition, J-curve effect and pass-through effect
- Examine the absorption approach to the balance of payments
- Identify policy instruments adopted by the government to tackle BOP imbalance, that is: the absorption instruments and the expenditure-switching instruments
- Evaluate the impacts of devaluation on national income and absorption
- Examine the monetary approach to the balance of payments
- Show how the monetary policies influence a country's BOP and the adjustment process under different exchange rate system

As discussed in the previous chapters, the balance of payments of a country reflects the supply and demand for the domestic currency on the foreign exchange market. Under the fixed exchange rate system, a country with BOP deficits usually has the pressure to devalue its currency, especially when the country runs persistent deficits on its international transactions. If the exchange rate is not allowed to change, the deficit country needs to make a series of adjustment on its domestic macroeconomic structure. On the other hand, a BOP surplus country has the pressure to revalue its currency. In some cases, the surplus nation also needs to change its domestic economic policies to reach

external equilibrium. Under the floating exchange rate system, major fundamental external disequilibrium is resolved through a change in exchange rate. It is usually the case that BOP deficit country's currency loses its value in the foreign exchange market, while the surplus country's currency gains value in the foreign exchange market.

In fact, no matter what exchange rate system is adopted, both the surplus country and the deficit country are required to reach balance-of-payments equilibrium. Because persistent balance-of-payments disequilibrium tends to have adverse economic consequences, there exists a need for adjustment.

This chapter examines two influential theories of balance-of-payments adjustment in the early days. The other two modern theories will be examined in the next chapter. We start the chapter by defining the elasticities of exports and imports demand and supply. The elasticity model assumes domestic and foreign prices are fixed and exchange rate changes have an impact on the current account position of a country. Will a devaluation (or a revaluation) of the domestic currency lead to a reduction of a current account deficit (surplus)? Then we shall learn the Marshall-Lerner condition, J-curve effect and pass-through effect of the elasticity approach. Finally, we analyze the absorption model which relates the BOP to income and spending. The model examines the effects of devaluation (revaluation) on domestic income and spending and has important implications for government's economic policies.

Elasticity Approach (Relative Price Effects)

Elasticity of Demand (Supply) for Exports and Imports

Before examining the elasticity approach, we must first understand the concept of elasticity. Elasticity is the ratio between proportional change in one variable and proportional change in another. The elasticity of export (or import) demand is defined as the percentage change in the quantity of exports (or imports) demanded divided by the percentage change in the price of the exports (or imports). Algebraically, the elasticity of export demand is written as:

$$E_X = \Delta Q_X / \Delta P_X \qquad (8.1)$$

The elasticity of import demand is written as:

$$E_M = \Delta Q_M / \Delta P_M \tag{8.2}$$

Where E_X: elasticity of export demand;

E_M: elasticity of import demand;

ΔQ_X: percentage change in the quantity of exports demand;

ΔQ_M: percentage change in the quantity of imports demand;

ΔP_X: percentage change in the price of the exports;

ΔP_M: percentage change in the price of the imports.

Suppose, for example, that when the price of imported laptops rises by 5%, the number of laptops imported falls by 10%. The elasticity of demand for imported laptops is calculated by applying **Equation (8.2)**:

$$-10\%/5\% = -2$$

The minus sign shows the negative relationship between price and demand. It shows if price goes up by 1 percent, the quantity demanded goes down by 2 percent.

The elasticity of export (import) supply is defined as the same way. It is a measure of the responsiveness of the quantity supplied to a change in price.

If demand is elastic, E_X (or E_M) >1; the proportional rise in quantity is more than a proportional cut in price, so total spent rises as price falls. This is contrasted with inelastic demand, where E_X (or E_M) <1, so total spent falls as price falls. If supply is elastic, an increase in price increases supply more than in proportion. Inelastic supply means an increase in price increases supply less than in proportion. If E_X (or E_M) $= 1$, it denotes unitary elastic demand (supply), meaning that the percentage change in quantity demanded (supplied) just matches the percentage change in price.

Assumptions of the Elasticity Approach

The elasticity approach examines the effects of currency devaluation (depreciation) on a country's balance of payments. A BOP deficit country may improve its BOP status by lowering its relative prices (exchange rates), so that exports increase and imports decrease. The theory is based on the following assumptions.

Assumption 1: Assume that *there are no net capital flows* (KA = 0). Thus,

the private supply and demand for foreign exchange are determined entirely by the current account. Since current account is dominated by the trade subaccount, it implies that the balance of payments is simply sales of the export minus spending on the import.

Assumption 2: Assume that *domestic residents look only at prices expressed in domestic currency*. Thus, in the case of domestic consumers, the demand for imports depends only on the price of the import expressed in domestic currency. In the case of domestic firms, the supply of exports depends only on the price of export expressed in domestic currency. Similarly, assume that *foreign residents look only at prices expressed in foreign currency* when choosing the demand for the home country's exports (in the case of foreign consumers) or the supply of imports to the home country (in the case of foreign firms). Changes in demand due to changes in income are ignored.

Assumption 3: Finally, assume for now that firms set a price for their product and then meet any forthcoming demand. In other words, assume that *supply is infinitely elastic*. This assumption implies that output levels are determined by demand, quantity supplied will not be affected by the changes in exchange rate.

If a country runs BOP deficit, the supply of the country's currency on foreign exchange market exceeds the demand for the country's currency. Or equivalently, the country's demand for foreign exchange exceeds its supply of foreign exchange. The goal of the devaluation is to bring the supply and demand for foreign exchange into equilibrium. Elasticity approach states that the key to the success of the devaluation depends on the price elasticities of demand for exports and imports.

The Effects of Devaluation or Revaluation

A devaluation on domestic currency will have two effects on the country's BOP. The first is the **price effect** which refers to the decreased quantity received of foreign exchanges after devaluation. This is because exports become cheaper measured in foreign currency; domestic residents will receive fewer foreign exchanges for the same amount of exports than before. Depreciation therefore makes domestic BOP worse. The second is the **volume effect**. It says that the depreciation leads to the increase of the export volume because of the cheaper

foreign price. In the meantime, imports decrease due to the expensive domestic price. The volume effect may improve the country's BOP.

For example, let's examine **Exhibit 8.1** which lists three possible scenarios after the RMB is devalued. Before devaluation the RMB/U.S. dollar exchange rate stands at ¥6.00/\$ (\$0.1667/¥), while after devaluation the RMB-dollar exchange rate is 7.00/\$ (\$0.1429/¥). The price of one unit of Chinese exports is ¥6 and the price of one unit of U.S. exports is \$2. After devaluation, the RMB price of Chinese exports remains the same, but the dollar price of Chinese exports is decreased from \$1 to \$0.8571. The RMB price of U.S. exports rises from ¥12 to ¥14.

Exhibit 8.1 Devaluation and the balance of payments

Before devaluation the current account is in balance				
Description	Volume	¥ Price	\$ Price	Dollar receipts (+) Payments (−)
Chinese exports	12,000	¥6	\$1	(+) \$12,000
Chinese imports	6,000	¥12	\$2	( ) \$12,000
Current account				\$0
Case 1 devaluation leads to a current account deficit				
Chinese exports	13,200	¥6	\$0.8571	(+) \$11,314
Chinese imports	5,775	¥14	\$2	(−) \$11,500
Current account				−\$186
Case 2 devaluation leaves the current account unaffected				
Chinese exports	13,560	¥6	\$0.8571	(+) \$11,622
Chinese imports	5,811	¥14	\$2	(−) \$11,622
Current account				\$0
Case 3 devaluation leads to a current account surplus				
Chinese exports	13,800	¥6	\$0.8571	(+) \$11,828
Chinese imports	5,400	¥14	\$2	(−) \$10,800
Current account				\$1,027

Before devaluation, China exports 12,000 units of goods and receives

$12,000; it imports 6,000 units of goods from America and pays $12,000; so China's BOP is balanced. A devaluation on RMB may have three consequences for China's BOP. First, the devaluation leads to a BOP deficit because the price effect dominates the volume effect. The exports increase by 10% but the dollar receipts reduce to $11,314. In the meantime, the imports only decrease by 3.75%; and the dollar payment is $11,500. Therefore, the devaluation on RMB leaves a $186 deficit on China's BOP. Second, the devaluation leaves the current account unaffected. In this case, the elasticity of export demand is bigger than that in the first case; even the elasticity of import demand is slightly smaller. The dollar payment is equal to the dollar receipt; China's BOP is in equilibrium. Third, the devaluation leads to a current account surplus. The 10% reduction in the quantity of imports coupled with a 15% rise in the quantity of exports results in a $1,027 BOP surplus.

This example shows whether the China's BOP will be improved depends on the elasticities of export and import demand. The more elastic the exports and imports demands are, the more effective the devaluation is. The general rule that determines the actual outcome of the devaluation is called Marshall-Lerner condition which will be discussed shortly.

The devaluation also has the so called **terms of trade effect**. The terms of trade refer to the number of units of imports that one unit of exports will buy (or vice versa) and can be calculated by dividing the price of exports by the price of imports. If, for example, the price of one unit of exports is ¥20 and the price of one unit of imports is ¥100, the terms of trade are ¥20/¥100 = 0.2. In other words, one unit of exports will buy 0.2 unit units of imports.

Suppose that supplies of exports can be increased without increasing costs in domestic currency and supplies of imports can be reduced without causing a fall in their foreign currency price. Then the price of exports in domestic currency will remain constant and their price in foreign currency will fall by the full amount of the devaluation while the foreign currency price of imports remains constant. In this case the terms of trade will deteriorate by the full amount of the devaluation. If, for example, the unit cost of exports is ¥6 and the value of the RMB goes from ¥6 = $1 to ¥7 = $1, the foreign currency value of an export unit goes from ¥6/¥6 = $1 to ¥6/¥7 = $0.8571. With the foreign currency price of an import unit constant at $2 the terms of trade fall from 0.5

to 0.4286. Hence, the deterioration of the terms of trade due to a devaluation is maximum when supply elasticities are infinite that is, when the exports and imports of the devaluing country are supplied at constant cost. It is minimum when the supply elasticities are zero — that is, when costs rise proportionately in the devaluing country or fall proportionately in the rest of the world.

Marshall-Lerner Condition

Assuming infinite supply elasticities for imports and exports, **Marshall-Lerner condition** states that devaluation will always improve the trade balance if the sum of the demand elasticities for imports and exports is greater than one. That is:

$$E_X + E_M > 1 \tag{8.3}$$

If the sum of the demand elasticities is less than one, devaluation will worsen the trade balance. If the sum of the demand elasticities equals 1, the trade balance will be neither helped nor hurt. The Marshall-Lerner condition may be stated in terms of the currency of either the nation undergoing a devaluation or its trading partner.

Empirical Evidence on Import and Export Demand Elasticities

The possibility that a devaluation may lead to a worsening rather than improvement in the balance of payments led to much research into empirical estimates of the elasticity of demand for exports and imports. During the 1940s and 1950s, there was considerable debate among economists concerning the empirical measurement of demand elasticities. Several early studies suggested low demand elasticities. Those findings led to the formation of the elasticity pessimist school of thought, which contended that currency devaluations and revaluations would be largely ineffectual in promoting changes in a nation's trade balance. From 1960s, most economists estimated the demand elasticities for most nations and found that the elasticities of demand were rather high. For example, a summary by Gylfason (1987) of 10 econometric studies undertaken between 1969 and 1981 has shown that the Marshall-Lerner condition was fulfilled for all of the 15 industrial and nine developing countries surveyed, and the results are shown in **Exhibit 8.2**. The results are based on estimates of the

elasticities over a two-three-year time horizon. As such, while the table demonstrates clearly that a devaluation will improve the current account over such a time span, it does not preclude an initial J-curve effect.

Exhibit 8.2 The elasticity of demand for exports and imports of 15 industrial and 9 developing countries

	Elasticity of export demand	Elasticity of import demand	sum
Industrial countries			
Austria	1.02	1.23	2.25
Belgium	1.12	1.27	2.39
Canada	0.68	1.28	1.96
Denmark	1.04	0.91	1.95
France	1.28	0.93	2.21
Germany	1.02	0.79	1.81
Iceland	0.83	0.87	1.70
Italy	1.26	0.78	2.04
Japan	1.40	0.95	2.35
Netherlands	1.46	0.74	2.20
Norway	0.92	1.19	2.11
Sweden	1.58	0.88	2.46
Switzerland	1.03	1.13	2.16
United Kingdom	0.86	0.65	1.51
United States	1.19	1.24	2.43
Average	1.1	0.99	2.09
Developing countries			
Argentina	0.6	0.9	1.5
Brazil	0.4	1.7	2.1
India	0.5	2.2	2.7
Kenya	1.0	0.8	1.8
Korea	2.5	0.8	3.3
Morocco	0.7	1.0	1.7

Continued

	Elasticity of export demand	Elasticity of import demand	sum
Pakistan	1.8	0.8	2.6
Philippines	0.9	2.7	3.6
Turkey	1.4	2.7	4.1
Average	1.1	1.5	2.6

Note: The above estimates refer to price elasticities over a 2 - 3 year period. Estimates are based upon the results of a number of different studies. Individual studies give differing estimates depending on the time periods involved, the econometric methodology employed and the particular data-set used.
Source: Gylfason (1987), ***European Economic Review***, vol. 31, p 377.

The table shows that Sweden's export demand is most elastic. This measure indicates that when the prices of Swedish goods and services fall by 1 percent, other countries' demand for imported Swedish goods and services rises by 1.58 percent. The United Kingdom's import demand is least sensitive to changes in prices of the imports. When prices of U. K. imports increase by 1 percent, U.K. demand for imports decreases by only 0.65 percent.

J-curve Effect

The immediate effect of devaluation is a change in relative prices. Exports will rise because of the cheaper price in terms of the foreign currency; imports will fall due to the higher domestic price. For devaluation to take effect, time is required for change in prices to induce changes in the volume of exports and imports.

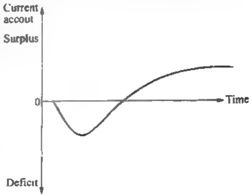

Figure 8. 1 J-curve effect

Figure 8. 1 is the so called **J-curve effect** which illustrates that in the beginning of the devaluation the trade balance may get worse and then get better over the longer run. In other words, elasticities are lower in the short run than in the long run, in which case the Marshall-Lerner

condition may not hold in the short run but may hold in the medium to long run.

The J-curve effect shows that right after devaluation export and import volumes do not change much so that the country's export revenue declines and import expenditure does not reduce leading to the current account balance deteriorating. However, after a time lag quantity of exports rises and the quantity of imports falls, and consequently the trade deficit starts to improve and eventually moves into surplus. In general, long-run elasticities (greater than two years) are approximately twice as great as short-run elasticities (0 - 6 months). Further, the short-run elasticities generally fail to sum to unity, while the long-run elasticities almost always sum to greater than unity.

J-curve effect played a role for the U.S. current account during 1985 - 87; the deficit initially rose in both absolute terms and as a percentage of U.S. gross national product, but after a lag of approximately two years it improved with long-run elasticities for imports and exports summing to 1.9 in excess of that required by the Marshall-Lerner condition.

What factors might explain the time lags in a devaluation's adjustment process? There have been numerous reasons advanced to explain the slow responsiveness of export and import volumes in the short run and why the response is far greater in the longer run. The most important reason is the **time lag** in consumer and producer response. It means that both consumer and producer need time to respond to the changed situation.

Time is needed for foreign consumers to switch away from their domestically produced goods towards the exports of the devaluing countries even though the prices are cheaper. On the other hand, after devaluation, the devaluing country's imports are expensive so the domestic customers may switch away from foreign imported goods to domestically produced goods. It also takes time because consumers will be worried about issues other than the price change, such as the reliability and quality of domestic produced goods as compared to the foreign imports. They need time to find suitable alternatives to the relatively more expensive imported goods and services.

The same time lag exists for producers to respond to the price change. In short-run, the producers of the devaluing country may not have enough time to expand production of exports because of their limited capabilities. Therefore, it

is unlikely that exports will increase dramatically at the beginning of the devaluation. As to imports, imports orders are normally made well in advance and such contracts are not readily cancelled right after the devaluation. Some companies will be reluctant to cancel orders for vital inputs and raw materials which are necessary for making the products. For some firms, there are replacement lags in using up inventories and wearing out existing machinery before placing new orders.

Empirical evidence suggests that the trade-balance effects of devaluation do not materialize until months or even years afterward. Adjustment lags may be for several years. In 1967, the British balance of trade had a $1.3 billion deficit. The Bank of England devalued the pound by 14.3% at the end of 1967 and tried to improve its trade position. The initial impact of the devaluation was negative; in 1968, the British balance of trade deteriorated with a deficit of $3 billion. However, after a time lag, the imports gradually reduced and exports started to rise. By 1969, the British balance of trade recorded a $1 billion surplus; by 1971, the surplus surged to $6.5 billion. The U.S. balance of trade had similar experiences during the 1980s and 1990s.

The Pass-through Effect of a Depreciation or Appreciation

Economists use the term **pass-through effect** to describe the extent to which a depreciation (appreciation) of the currency leads to a rise (fall) in import prices. Pass-through is important because buyers have incentives to alter their purchases of foreign goods only to the extent that the prices of these goods change in terms of their domestic currency following a change in the exchange rate. This depends on the willingness of exporters to permit the change in the exchange rate to affect the prices they charge for their goods, measured in terms of the buyer's currency.

If there is complete pass-through, a 10% depreciation (appreciation) of the currency leads to a 10% rise (fall) in import prices. If RMB depreciates by 10%, complete pass-through implies the import prices in RMB rise by the full proportion of the RMB depreciation which is 10%. If, however, a 10% depreciation (appreciation) leads to only an 8% rise (fall) in import prices, then there is only a partial pass-through effect, with the elasticity of exchange rate pass-through being 0.8. Empirical evidence suggests, however, that the more typical real world situation

is partial pass-through with significant time lag. For example, in the United States, it is estimated that for every 10% change in the value of the dollar, both import prices and export prices change about 6%.

The main reason to explain the partial pass-through is that the producers are willing to cut profits or absorb losses in order to keep its market share. It is not easy for a firm to build up a share of foreign markets. This being the case, a foreign firm may be very reluctant to sacrifice market share in the devaluing country and might respond to reducing profit margin on its exports to the devaluing country. For example, during the 1980s, U. S. dollar depreciated against the Japanese yen by more than 47%. Prior to the dollar depreciation, Japanese automakers enjoyed a super-normal 12% profit margin on their car sales to the U.S. market — nearly double that of U.S. automakers. After the dollar depreciation, the Japanese automakers kept profit margin thin, cutting their profits by $518 per vehicle. The dollar's depreciation was partly offset by the reducing prices of the Japanese cars.

The exporters of the devaluing country may seek to increase their profit margin so that prices do not fall proportionate to the devaluation in foreign markets. On the other hand, those foreign-import-competing industries may react to the threat of increased exports by the devaluing country by reducing prices in their home markets, limiting the amount of additional exports by the devaluing country.

Therefore, the partial pass-through effect on the price of imports in the short run also explains the J-curve effect. It will dampen the size and complicate the dynamics and timing of the J-curve effect. The prices of imports do not rise as much as suggested by the devaluation, which makes the trades balance deteriorate in the very short run. However, as the exchange rate depreciation is increasingly passed on over time, this will gradually improve the BOP of the devaluing country.

The Absorption Approach (Income Effects)

The elasticity approach is based on the analysis of partial equilibrium; it focuses on the price effect of a devaluation (revaluation). The approach neglects devaluation induced effects on income and expenditure. This is

regarded as the major defects of the elasticity approach. Sidney Stuart Alexander (1952) developed what is called the absorption approach. The theory studies the effects of price changes on the quantities supplied and demanded under the condition that the other relevant variables have been allowed to change. In other words, the absorption approach focuses on the fact that a current account imbalance can be viewed as the difference between domestic output and domestic expenditure (absorption). It poses the problems of balance-of-payments adjustment in a way which highlights their policy implications, and it allows for conditions of full employment and inflation.

Brief Description of the Absorption Approach

The elasticity approach assumes the relative price effects on the balance of payments. The absorption approach takes into consideration variations in income and consumption. The theory assumes a country's BOP is the current account; that is: no capital flows. It states that changes in real income (calculated by constant price) result in changes in a country's BOP. It is, therefore, a short-run approach to BOP and exchange rate determination.

According to the theory of macroeconomics, a country's national income (Y) must be equal to its aggregate expenditure (E), that is:

$$\text{National Income (Y)} = \text{Aggregate Expenditure (E)} \tag{8.4}$$

Aggregate expenditure can be categorized into four groups in an open economy: consumption (C), investment (I), government expenditure (G), Import and export (X−M). It can be expressed as following:

$$\text{Aggregate expenditure } (E) = C + I + G + (X - M) \tag{8.5}$$

Since national income equals to aggregate expenditure, so:

$$Y = E = C + I + G + (X - M) \tag{8.6}$$

Rearrange Equation (8.6) yields

$$X - M = Y - C - I - G, \text{ or}$$

$$X - M = Y - (C + I + G) \tag{8.7}$$

(X − M) is the balance of trade which represents a country's current account (CA); Y is the national income, (C + I + G) are the aggregate

expenditure on domestic goods and services. The absorption approach defines (C + I + G) as domestic absorption (A), so equation (8.7) can be rearranged as follows:

$$CA = Y - A \tag{8.8}$$

Equation (8.8) says a country's BOP is the difference between the national income or output and domestic absorption. Then, if

$CA > 0$, BOP surplus; the country produces more output than it absorbs;

$CA < 0$, BOP deficit; the country's income is less than its absorption;

$CA = 0$, BOP balanced; the country's national income equals to the total expenditure on domestic goods and services.

The absorption approach argues that a government should implement appropriate policies to erase a country's BOP deficit or surplus. If a country runs BOP deficit, it should adopt economic policies that increase domestic output or reduce domestic absorption. If a country has BOP surplus, it can use those policies to increase absorption or reduce total output.

Policy Instruments

The absorption approach suggests two policy instruments that the government can use to tackle current account imbalance. Absorption instruments include fiscal and monetary policies. Expenditure-switching instruments refer to the controls on both trade and foreign exchanges.

Absorption instrument is the instrument that government can use to change a nation's absorption. If a country runs trade deficit, it can adopt restrictive fiscal and monetary policies to reduce domestic absorption. For example, the government can reduce the nation's absorption by cutting its own expenditures on goods and services, or by discouraging households and firms from consuming and investing through high tax rates. The restrictive monetary policy such as high interest rate also effectively limits domestic absorption. However, the restrictive fiscal and monetary policies may also reduce the total output. Since any such policy will tend to reduce income and employment, it will have an additional attraction if the country is suffering from inflationary pressure as well as a balance-of-payments deficit, but a corresponding disadvantage if the country is suffering from unemployment. Moreover, since the impact reduction

in expenditure and the total reduction in income and output required to correct a given deficit are larger than the proportion of the expenditure reduction falling on home-produced goods, and since different methods of expenditure-reduction may differ in this respect, the choice between alternative methods may depend on the inflationary-deflationary situation of the economy. Finally, since the accompanying reduction in income may lead to some reduction in the domestic price level, and a greater eagerness of domestic producers to compete with foreign producers both at home and abroad, absorption instrument may have incidental expenditure-switching effects. On the other hand, expansionary fiscal and monetary policies promote consumption and investment and thus increase total output. In most cases, the absorption instrument is combined with expenditure-switching instrument to realize the goal of high output and low absorption.

Expenditure-switching instrument is the policy that the government can use to alter or switch expenditures among imports and exports. It seeks to correct a deficit by switching demand away from foreign towards domestic goods; and it depends for success not only on switching demand in the right direction, but also on the capacity of the economy to make available the extra output required to satisfy the additional demand. The instrument may be divided into two types, according to whether the policy instrument employed is general or selective: devaluation and trade controls. Devaluation aims at switching both domestic and foreign expenditure towards domestic output; controls are usually imposed on imports, and aim at switching domestic expenditure away from imports towards home goods, though sometimes they are used to stimulate exports and aim at switching foreigners' expenditure towards domestic output.

If a country has trade deficits, it can impose trade restrictions on imports and encourage exports. The prices of imports are raised up because of the tariffs. People may switch from expensive imports to relative cheap goods and services produced domestically. Tariffs and quotas are the common restrictions on imported goods and services; while dumping and export subsidies are the usual way for a government to help improve trade condition. **Dumping** means a producer sells abroad at lower prices than at home. **Export subsidy** refers to the special tax exemptions and provision of capital at favored rates granted by a government to increase the volume of exports. The combination of absorption

and expenditure-switching in some cases can effectively tackle the BOP disequilibrium.

The absorption approach also considers the impacts of currency devaluation (revaluation). Not like the elasticity approach, the absorption approach focuses on the impacts of devaluation on national income and absorption. It argues that currency devaluation will improve the devaluing country's trade balance only if total output exceeds its absorption level. It implies that the devaluing country should increase its total output, reduce its absorption, or do some combination of the two.

The Effects of a Devaluation on National Income

The effects of a devaluation on the current balance will depend upon how it affects national income relative to how it affects domestic absorption. There are two cases faced by an economy: full employment and unemployment. If an economy is already at full employment, there are no unutilized resources available for additional production. Therefore, it is impossible to raise total output in this case. The only way in which devaluation can improve the trade balance is for the economy to somehow cut domestic absorption, freeing resources needed to produce additional export goods and import substitutes.

When an economy operates below full capacity, it can direct idle resources into the production of goods for export after devaluation if Marshall-Lerner condition is fulfilled. The devaluation has the **employment effect** which means the devaluation brings more national income. In addition, the increased output will divert spending away from imports to domestically produced substitutes. The impact of the devaluation is thus to expand total output as well as to increase the domestic absorption. The question is whether devaluation improves a country's current account balance.

Since the absorption also rises because of the increased income, the increased absorption should be less than the increased income if current account improves. Otherwise the current account worsens. The **marginal propensity to absorb** is the ratio of additional absorb to the additional income. If this ratio is greater than 1, additional absorb is greater than additional income, the current account is not likely to improve. Only if the marginal propensity to absorb is less than 1, the current account will get better. People may think that the

marginal propensity to absorb is always less than unity. However, it is not necessary the case. For example, unemployed workers who obtain jobs are likely to have a high propensity to consume. They may decide to spend more than their income by borrowing against future prospective income. Similarly, as the economy expands firms' expenditure may exceed their revenues as they undertake significant investment in the expectation of high future profits. Hence, it is conceivable in the short run that the marginal propensity to absorb could be greater than unity, so that a rise in income leads to a deterioration in the current account.

Another effect of devaluation on national income concerns the **terms of trade**. Since the terms of trade deteriorate after devaluation, the national income thus decreases because more units of exports have to be given to obtain a unit of imports.

The Effects of a Devaluation on Direct Absorption

For the moment, let us assume that the net effect of a devaluation on income is zero. This being the case, we must consider the effect of the devaluation on direct absorption. If the devaluation reduces direct absorption, then a devaluation will lead to an improvement in the current balance, whereas if direct absorption increases then the effect on the current balance will lead to a deterioration of the current account. Let us now consider possible ways in which a devaluation can be expected to impact upon direct absorption.

The first and most important effect of a devaluation on direct absorption is the **Income redistribution effect**. If Marshall-Lerner condition is fulfilled, exporters and import-competing firms should experience an increase in income due to the expansion in exports industries and import-competing industries. On the other hand, domestic consumers should experience a reduction in income because of the higher prices of imports and substitutes. Overall, it is extremely difficult to say whether the income redistribution effect will raise or lower absorption. When the general price level rises, some people tend to reduce their consumption. Other people may like to absorb more.

The second effect of a devaluation on direct absorption is **real balance effect**, which is the effect on spending, of changes in the ratio of money balances to income. As prices rise following devaluation, the real purchasing

power of the money people already hold goes down. This is expected to make people more likely to save and less likely to spend their incomes. Also, people tend to sell bonds and stocks in an effort to maintain real cash balances. Thus the prices of stocks and bonds fall and the interest rates rise. The rise in interest rates causes a reduction in investment and consumption, so reducing direct absorption.

For the real balance effect to come into play, it must be emphasized that the authorities must not accommodate the increased money demand by increasing the money supply in line with the increased money demand. If they raise the money supply, this would leave the ratio of money to price index constant so that the real balance effect will not come into play.

Hence, the effects of a devaluation on absorption are ambiguous. Nonetheless, the absorption approach has some important lessons for policy-makers. Its central message is that raising domestic income relative to domestic absorption will improve the current balance. In this respect, a devaluation is more likely to succeed if it is accompanied by economic policy measures that concentrate on raising income while constraining absorption.

Summary

1. A fundamental disequilibrium in BOP has perplexed governments all the time. Two traditional models to solve the problem are popularly known as the elasticity approach and absorption approach. Both models were created to answer the question in an open economy — will a devaluation (or revaluation) of the exchange rate lead to an equilibrium of the current account in BOP?
2. The elasticity approach examines the impact of changing in exchange rate on the current account. The aim is to restore the equilibrium of the current account through the devaluation (or revaluation) of the domestic currency.
3. The Marshall-Lerner condition states that a devaluation of the domestic currency will improve the current account only if the sum of the elasticity of the demand for exports and imports is greater than unity assuming the elasticity of the supply of exports and imports is infinite.
4. After the devaluation, prices of domestic exports fall in terms of the

foreign currency. It means each unit of export receives fewer units of foreign currency than before. This is the price effect of the devaluation and it clearly worsens the current account.

5. The decreased prices of domestic exports encourage foreign consumers to buy more domestic exports. Thus, a devaluation of the domestic currency brings increased volume of exports. At the same time, the increased prices of foreign imports lead to a decreased volume of imports. The volume effect of a devaluation contributes to improving the current account.
6. J-curve illustrates that in the short run the Marshall-Lerner condition may not be fulfilled but in the long run it may hold. That is to say, in a short period of time after the devaluation, current account may worsen. Later, it gradually improves.
7. The pass-through effect describes the extent to which a x% of devaluation leads to a x% of rise in import prices. The empirical study shows the partial pass-through effect on the price of imports in the short run will be to dampen the size and complicate the dynamics and timing of the J-curve effect.
8. The absorption approach regards the current account imbalance as the difference between domestic output and domestic spending. The current account deficit means the expenditure exceeds the income, and vice versa.
9. Policy instruments the government can use to tackle the disequilibrium BOP are absorption instruments and expenditure-switching instruments. The former are generally the fiscal and monetary policies. The latter are the administrative measures on trade and foreign exchanges.
10. The absorption approach thinks a devaluation has impacts on both the national income and direct absorption. The effects of a devaluation on income include employment effect and terms of trade effect. Whether those effects will raise or lower income depends on many factors, such as the marginal propensity to absorb.
11. The effects of a devaluation on direct absorption include income redistribution effect and real balance effects. Generally speaking, the effects of a devaluation on direct absorption are ambiguous. Nonetheless, the absorption approach has some important lessons for policy-makers. Its central message is that raising domestic income relative to domestic

absorption will improve the current balance. In this respect, a devaluation is more likely to succeed if it is accompanied by economic policy measures that concentrate on raising income while constraining absorption.

Key Terms

Absorption approach (吸收论)
Absorption instrument (吸收政策)
Dumping (倾销)
Elasticity (弹性)
Elasticity approach (弹性论)
Elasticity of demand (supply) (需求(供给)弹性)
Employment effect (就业效应)
Expenditure-switching instrument (支出转换政策)
Export subsidy (出口补贴)
Import tariff (进口关税)
Import quota (进口配额)
J-curve effect (J 曲线效应)
Marginal propensity to absorb (边际吸收倾向)
Marshall-Lerner condition (马歇尔-勒纳条件)
Pass-through effect (转嫁效应)
Portfolio balance approach (组合资产平衡论)
Price effect (价格效应)
Real balance effect (实际余额效应)
Real income (实际收入)
Terms of trade effect (贸易条件效应)
Time lag (时滞)
Volume effect (数量效应)

Questions

1. Define the elasticity of export demand and the elasticity of import demand.
2. How does a currency depreciation or devaluation affect a nation's balance of trade according to the elasticity approach?

3. If volume effect dominates price effect after a devaluation, is the sum of elasticities of export and import demand greater or less than 1?
4. What is Marshall-Lerner condition? Do recent empirical studies suggest that world elasticity conditions are sufficiently high to permit successful depreciations or devaluations?
5. Define the terms of trade. How does a devaluation affect the terms of trade for devaluing country?
6. What is J-curve effect? Why does J-curve occur after devaluation?
7. How do elasticities of supply and demand for imports and exports affect the supply and demand for foreign exchange?
8. Explain the reasons of partial pass-through effect on the price of imported goods in the short-run.
9. According to the absorption approach, does it make any difference whether a nation devalues its currency when the economy operates at less than full capacity versus at full capacity?
10. How can devaluation-induced changes in household money balances promote BOP equilibrium?
11. If Chinese government promotes an advertising campaign called "Buy Chinese products", what is the potential impact the campaign might have on the China's balance of payments in the context of the absorption approach?
12. Is marginal propensity to absorb necessarily greater than 1? List several possible facts to prove your statement.
13. Explain the real balance effect of a devaluation.
14. Define income redistribution effect of a revaluation.
15. According to absorption approach, what kind of economic policies should the government adopt when a nation runs BOP deficit?

CHAPTER 9
THE BALANCE-OF-PAYMENTS ADJUSTMENT (2)

LEARNING OBJECTIVES

- Examine the monetary approach to the balance of payments
- Show how the monetary policies influence a country's BOP and the adjustment process under different exchange rate system
- Learn how the exchange rate is determined in a two-country monetary model
- Examine the portfolio balance approach to the exchange rate determination
- Understand the wealth identity and the relationship of each variable in the portfolio balance model
- Know central bank's sterilized and non-sterilized intervention in the foreign exchange market

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Chapter 8 introduced two traditional approaches to balance of payments. Both elasticity and absorption approaches do not consider the monetary consequences of the devaluation (revaluation). Both theories also neglect the implications of capital movements for the balance of payments and exchange rates. In this section, we shall look at one of the most influential theories of the balance-of-payments adjustment known as the monetary approach and another modern theory of the exchange rate determination the portfolio balance approach. The monetary theory was pioneered by Marina Whitman (1975), Jacob Frenkel and Harry Johnson (1976). The portfolio balance approach was established in 1983. The fundamental basis of the monetary approach is that the balance of payments is essentially a monetary phenomenon. Not only is the balance of payments a measurement of monetary flows, but such flows can only

be explained by disequilibrium in the stock demand for and supply of money. On the other hand, the portfolio balance approach extends the monetary approach. It indicates the securities market plays an important role in the exchange rate determination because of the imperfect substitutability between domestic and foreign financial assets.

We shall begin to learn the monetary model from the Cambridge equation. The relationship between money supply and balance of payments will be examined. We then analyze the model under the different exchange rate system and how the model works in a two-country situation. The portfolio balance approach will be introduced through a wealth identity. We then describe the asset demand function. The effects of the changes in money, domestic and foreign securities on the exchange rate will be discussed respectively. Finally, we shall explain the sterilized and non-sterilized foreign exchange market intervention by the central bank.

The Monetary Approach

The purchasing power parity outlined in Chapter 5 is far from a satisfactory explanation of observed exchange rate behavior. However, the theory indicates that, at least in the long run, exchange rates are closely related to the levels of prices for products in different countries. It also suggests the next question of what factors determine the average national price level or the rate at which it changes. We know it is the inflation rate. Economists believe that the money supply determines the price level (or the inflation rate) in the long run. This suggests that money supplies in different countries through their links to national price levels and inflation rates are closely linked to exchange rates in the long run.

The Money Demand

The monetary approach postulates that changes in a country's BOP and the exchange rate are a monetary phenomenon. That is, BOP disequilibrium or exchange rate variations result from changes in the country's quantity of money supplied and demanded. The monetary approach begins with the Cambridge equation, which is the quantity theory of money developed in the late

nineteenth century.

The **Cambridge equation** is written as:

$$M^d = k\,P\,y \tag{9.1}$$

where M^d is the demand for nominal money balances that people desire to hold, P is the domestic price level, y is real domestic income (calculated by constant price), and k is a parameter reflecting economic structure and monetary habits, namely the ratio of desired money balances to income ($k > 0$). Multiplying P by y yields the nominal income. This equation states that people hold a fraction of their nominal incomes as money balances.

The Cambridge equation also shows that the demand for money is a positive function of the domestic price and income level. A rise in the domestic price level will lead to an equally proportionate increase in the demand for money. The demand for money is positively related to real domestic income; a rise in real income will, ceteris paribus, lead to an increase in the transactions demand for money.

The Money Supply

The domestic money supply in the economy is made up of two components:

$$M^s = m\,(D + R) \tag{9.2}$$

where M^s is the quantity of money supplied by the monetary authority, D is domestic credits and R is the reserves of foreign currencies. The domestic credits and the foreign exchange reserves ($D + R$) constitute a country's **monetary base**. m is the **monetary multiplier**.

When the central bank conducts an open-market operation, that is: purchasing treasury bonds held by the public, it puts the domestic credits into circulation. Also, if central bank buys foreign exchanges in the foreign exchange market, the central bank's monetary liabilities increase. Therefore, any increase in the domestic money supply can come about through either an open-market operation or a foreign exchange operation. The central bank plays a very important role in the determination of a country's money supply. It usually influences the quantity of money supplied through controlling the monetary base.

The Relationship between Money Supply and BOP

The equilibrium condition in money market is that the money demand equals the money supply, that is:

$$M^d = M^s \tag{9.3}$$

The money supply is composed of domestic credits and foreign exchange reserves. Suppose $m = 1$, $R = M^d - D$, that is to say, if money demand exceeds nominal money supply, foreign exchange reserve is positive, and BOP has surplus; if nominal money supply exceeds money demand, foreign exchange reserve is negative, and BOP runs deficits.

Therefore, the monetarists view balance-of-payments surpluses and deficits as monetary flow due to stock disequilibrium in the money market. A deficit in the balance of payments is due to an excess of the money supply in relation to money demand, while a surplus in the balance of payments is monetary flow resulting from an excess demand for money in relation to the stock money supply. Thus the balance-of- payments disequilibrium is merely a reflection of the disequilibrium in the money market. In this sense the monetary flows are the "autonomous" items in the balance of payments while the purchases and sales of goods/services and investments (long, medium and short-term are viewed as the accommodating items, this is completely the reverse of the Keynesian approach which views the current account items as the autonomous and capital account and reserve changes as the accommodating items. This different way of looking at the balance-of-payments statistics is sometimes contrasted by saying that Keynesians look at the balance-of-payments statistics from the "top down" (that is, the current account) while the monetarists look from the "bottom up" (the change in reserves).

Monetarists observe that the overall balance of payments can be thought of as consisting of the current account balance, financial and capital account balance and changes in the authorities' reserves. That is:

$$\text{BOP} = CA + KA + dR$$

so that:

$$CA + KA = -dR \tag{9.4}$$

where CA is the current account balance, KA is the financial and capital

account balance and dR is the change in the authorities reserves. If the recorded dR in the balance of payments accounts is positive, this means that the combined current account and capital account are in deficit. This implies that reserves have fallen as the authorities have purchased the home currency with foreign currency reserves.

Monetary Approach under the Fixed Exchange Rate System

Now we substitute the equation for the Cambridge equation and the money supply into the equation (9.3) to yield:

$$kPy = m\ (D + R) \tag{9.5}$$

Monetary approach assumes the purchasing power parity holds. The domestic price level (P) in equation (9.5) can then be replaced by the product of foreign price level times the exchange rate ($S^{d/f}P^f$). That is:

$$k\, S^{d/f}P^f\, y = m\ (D + R) \tag{9.6}$$

Equation (8.14) is used by monetarists to explain how key variables affect a country's balance of payments and the exchange value of its currency. Now consider what happens if the central bank raises domestic credit (D) under the fixed exchange rate system. Since domestic monetary base rises, money supply exceeds money demand and BOP runs deficits.

$$m(D\uparrow + R) > k \cdot S^{d/f}P^f \cdot y \quad \text{(BOP deficit)}$$

There is a pressure for the domestic currency to depreciate. The central bank then sells foreign exchange reserves in the foreign exchange market in order to defend the fixed exchange rates. The central bank's intervention on the foreign exchange market offsets the effects of increased domestic credits on the domestic credit market. In other words, the increased credits are offset by the reduced foreign exchange reserves. The central bank will continue to sell foreign exchange reserves until $M^s = M^d$.

$$m(D\uparrow + R\downarrow) = k \cdot S^{d/f}P^f \cdot y$$

Monetary approach indicates that an increase in domestic credit generates a BOP deficit, while a decrease in domestic credit results in a BOP surplus.

Now let's consider the impact of changes in money demand on BOP.

Suppose that instead of a change in domestic credit there is an increase in either the foreign price level or real income which causes an increase in the quantity of money demanded. The country now runs BOP surplus and its currency faces the pressure of revaluation. That is:

$$m(D+R) < k \cdot S^{d/f}P^f \uparrow \cdot y \uparrow \quad \text{(BOP surplus)}$$

To prevent the domestic currency from revaluing, the central bank must buy foreign exchange reserves in the foreign exchange market. The domestic credit then increases until:

$$m(D \uparrow + R) = k \cdot S^{d/f}P^f \uparrow \cdot y \uparrow$$

The conclusion is that a rise in either the foreign price level or domestic real income results in a BOP surplus. Likewise, a decline in either the foreign price level or domestic real income results in a BOP deficit.

Monetary Approach under the Floating Exchange Rate System

Under a flexible exchange rate regime, a country does not have the obligation to maintain the exchange rate. The R component of the monetary base, therefore, does not change. The spot exchange rate, S, will adjust to eliminate any monetary disequilibrium. Suppose the central bank expands domestic credit, so the money supply exceeds money demand.

$$m(D \uparrow + R) > k \cdot S^{d/f}P^f \cdot y \quad \text{(BOP deficit)}$$

Now the domestic currency must depreciate to balance money supply and money demand and thus the balance of payments, that is:

$$m(D \uparrow + R) = k \cdot S^{d/f} \uparrow P^f \cdot y$$

If the money demand increases because of the increase in foreign price level or domestic real income, BOP runs surplus.

$$m(D+R) < k \cdot S^{d/f}P^f \uparrow \cdot y \uparrow \quad \text{(BOP surplus)}$$

In this case, the domestic currency will appreciate. The appreciation continues until the quantity of money supplied once again equals the quantity of money demanded. The country's BOP restores to be in equilibrium.

$$m(D+R) \quad k \cdot S^{d/f} \downarrow P^f \uparrow \cdot y \uparrow$$

We may conclude that under floating exchange rate system the changes in domestic credit or foreign price level or domestic real income lead to changes in exchange rates.

Monetary Approach in a Two-country Model

The monetary approach can be used to predict the exchange rate in a two-country setting. The quantity theory equation requires that the money supply be equal to the money demand in any country, which is directly proportional to the money value of their respective gross domestic products. Now we apply the quantity theory equation in domestic country and foreign country:

$$M_d^s = k_d \cdot P_d \cdot y_d \quad \text{(domestic country)} \tag{9.7}$$

And

$$M_f^s = k_f \cdot P_f \cdot y_f \quad \text{(foreign country)} \tag{9.8}$$

where M_d^s and M_f^s represent domestic money supply and foreign money supply (measured in domestic currency and foreign currency, respectively), P_d and P_f are the domestic and foreign price levels, and y_d and y_f are the real outputs.

Dividing equation (9.7) by equation (9.8), we get:

$$(M_d^s / M_f^s) = (k_d / k_f)(P_d / P_f)(y_d / y_f) \tag{9.9}$$

If purchasing power parity holds, which is $S^{d/f} = P_d / P_f$, we can predict the exchange rate based on domestic and foreign money supplies and national outputs. Rearranging the equation (9.9) yields:

$$(P_d / P_f) = (M_d^s / M_f^s)(k_f / k_d)(y_f / y_d) \tag{9.10}$$

Equation (9.10) shows the exchange rate is determined by several variables. Other things being equal, the faster domestic money supply (M_d^s / M_f^s up), slower growth in domestic real output (y_f / y_d up), or a rise in the ratio (k_f / k_d) leads to depreciation of the domestic currency ($S^{d/f}$ up). Conversely, a nation with slower money growth and a healthy real economy is likely to have an appreciating currency.

For example, if domestic money supply rises by 5%, ceteris paribus, the exchange rate $S^{d/f}$ is likely to rise by 5%, or the foreign currency will

appreciate against the domestic currency by 5%. Same is true if foreign real GDP rises by 5% compared to the domestic real GDP growth rate.

An exchange rate will be unaffected by balanced growth. If money supplies grow at the same rate in all countries, leaving M_d^s / M_f^s unchanged, and if domestic products and foreign outputs grow at the same rate, leaving y_f / y_d unchanged, there should be no change in the exchange rate.

The monetary approach is usually proved to be correct in the long-run trends of the exchange rates. Because over long periods, exchange rates tend to move toward values consistent with such economic fundamentals as relative money supplies and real incomes. For example, Japanese yen has experienced appreciation since early 1970s. The main reasons were Japan's stronger real economic growth, slower money supply and lower domestic inflation rate.

The Portfolio Balance Approach

The monetary approach focuses on the equilibrium in the money market. The theory postulate that a country's BOP and the exchange rate are determined by the quantity of money demanded and the quantity of money supplied in the money market. In other words, the monetary approach assumes that domestic and foreign financial securities are perfect substitutes. It implies that the expected yields on domestic and foreign securities are equalized via the uncovered interest rate parity condition. The portfolio balance approach expands the monetary approach by adding money, domestic financial instruments and foreign financial instruments in its model. The portfolio balance approach distinguishes itself from the monetary approach because it allows for the possibility that international investors may regard domestic and foreign securities as having different characteristics other than their currency of denomination, in particular, they might for various reasons regard one of the bonds as being more risky than the other. Therefore, the exchange rate is determined not only by the quantity demanded and supplied of the money, but also by the quantity demanded and supplied of the domestic and foreign securities.

Wealth Identity

The portfolio balance approach suggests that the exchange rate is

determined by the demand and the supply of money, domestic bonds and foreign bonds. According to the theory, people hold domestic money for transaction purposes. People are not willing to hold foreign money because the foreign money will not bring any interest income. If people do need foreign money they can obtain it through the foreign exchange market. A country's wealth is assumed to be composed of domestic money, domestic bonds and foreign bonds. The domestic bonds and the foreign bonds have different characteristics other than their currency of denomination. Maybe domestic bonds are more risky than foreign bonds or vice versa. In that case, people may require a higher expected return on the bond that is considered more risky to compensate for the additional risk it entails. To balance the risk and yields on different financial instruments, people desire to distribute their wealth over the domestic money, domestic bonds and foreign bonds. Thus we can express the wealth identity as follows:

$$W \equiv M + B^d + S^{d/f}B^f \tag{9.11}$$

Where W represents the people's wealth, M denotes the domestic money (or cash), B^d refers to the domestic bonds which will bring the interest income, $S^{d/f}$ is the spot exchange rate defined as the value of one unit foreign currency expressed as units of domestic currency, and B^f is the foreign bonds which also bring interest earnings. The product of $S^{d/f}B^f$ is the domestic currency value of foreign bonds. It means that the total wealth will increase if domestic currency depreciates against foreign currency, because the depreciation of domestic currency raises the domestic currency value of foreign bond holdings.

The Asset Demand Function

Since people will distribute their wealth over all three types of financial instruments, any change in the components of the wealth has impacts on the exchange rate or the interest rate. We now proceed to analyze the effects of monetary authority's actions on the exchange rate and domestic interest rate.

The demand to hold money is the function of several variables. It is positively related to domestic wealth and income. The demand to hold money is negatively related to the domestic interest rate and negatively related to the expected rate of return on foreign bonds. We can depict money market schedule in the exchange rate-interest rate plane. The money market schedule depicted in

Figure 9. 1 shows various combinations of the domestic interest rate for which money supply is equal to money demand. It is upward-sloping from left to right. Suppose that the exchange rate rises (depreciation of the domestic currency). The people's wealth increases because the value of foreign bonds people hold increases. This being the case, people will wish to hold more domestic money, but given the existing money stock the increased money demand can only be offset by a rise in domestic interest rate.

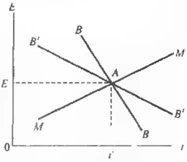

Figure 9. 1 Equilibrium in the capital market

The *BB* schedule is the various combinations of the domestic interest rate for which the demand for and supply of domestic bonds are equal. The demand for domestic bonds is positively related to the domestic interest rate and wealth, negatively related to the expected rate of return on foreign assets. The *BB* schedule is downward-sloping from left to right. The reason is that depreciation of domestic currency leads to increase of total wealth and thus increase of holding domestic bonds which, given the existing stock of domestic bonds, can only be offset by a fall in the domestic interest rate which will reduce their attractiveness to investors.

Also in **Figure 9. 1** , the B^fB^f schedule is downward-sloping. The demand for foreign bonds is positively related to the wealth and the expected rate of return from holding foreign bonds, negatively related to the domestic interest rate. Notice that the *BB* curve is steeper than the B^fB^f curve because the two assets are different. Another reason is that changes in the domestic interest rate affect the demand for domestic bonds more than they do on the foreign bonds.

The capital market is in equilibrium when the three curves meet at the point *A*. At point *A*, the equilibrium exchange rate is E_e, and the equilibrium interest rate is i_e. The actions of the central bank on the money market and bond market will affect the foreign exchange rate.

The Effects of a Change in Money Supply

Suppose the central bank increases money supply. The increased money supply makes the *MM* curve shift to the left as shown in **Figure 9. 2**. The capital

market was originally in equilibrium at point A with equilibrium exchange rate and equilibrium interest rate. The excess supply in the money market needs the increased money demand to keep the money market in equilibrium. This being the case, the interest rate must fall down. When domestic interest is down, the demand for domestic bonds decreases. If the exchange rate is up, the demand for foreign bonds increases. It implies that *BB* schedule shifts to the left and the B^fB^f schedule shifts rightward. With the increased money supply, the capital market reaches to the new equilibrium point A' of higher exchange rate (E_1) and lower interest rate (i_1).

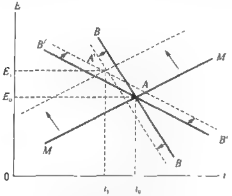

Figure 9.2 **Increased money stock and equilibrium in the capital market**

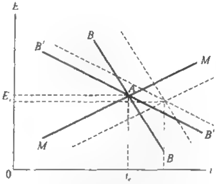

Figure 9.3 **Increased bonds stock and equilibrium in the capital market**

The Effects of a Change in Domestic Bonds

Now suppose domestic government increases bonds issue to finance its budgets. With the increase in domestic bonds, the interest rate should be up under the same exchange rate level to attract people to purchase the domestic bonds. The *BB* schedule thus shifts rightward. In the meantime, with the given interest rate, the total wealth expands because of the increase in the supply of domestic bonds. People add up their demand for domestic money and foreign bonds; *MM* and B^fB^f schedule shift to the right. The whole process is shown in **Figure 9.3**. It should be noted that it is not sure whether the exchange rate is up or down. If the substitution effect of the domestic bonds for foreign bonds is lower, the wealth effect dominates. In other words, the domestic currency depreciates and the exchange rate is up. If the substitution effect is high, the

exchange rate may decrease. In this figure, the interest rate is up and the domestic currency appreciates.

The Effects of a Change in Foreign Bonds

If the supply of foreign bonds increases, the $B^f B^f$ schedule shifts to the left. If domestic interest rates keep unchanged, domestic currency appreciates. **Figure 9.4** shows the new equilibrium point in the capital market when the supply of foreign bonds increases. When the exchange rate is down (domestic currency appreciates), people would like to hold more foreign bonds.

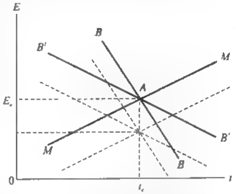

Figure 9.4 Increased foreign bonds and equilibrium in the capital market

The above analysis shows the exchange rate is determined by the equilibrium in the capital market. The central bank influences the exchange rate and interest rate through its open market operation. Up till now, the model only analyzes the short-term equilibrium in the capital market. When we examine the long-term equilibrium in the exchange rate and interest rate, we need to link the capital market with a country's current account. However, the short-term analysis of the portfolio balance model provides an important implication for policy-makers.

Sterilized or Non-sterilized Intervention in the Foreign Exchange Market

Suppose domestic currency appreciates in the foreign exchange market. If the central bank buys foreign currency in order to push down the value of the domestic currency, the central bank increases the supply of the domestic currency at the same time. This intervention is called a **non-sterilized intervention** which will change the domestic monetary base. Sometimes, central banks use the sterilized intervention to alter the exchange rate without changing the stock of domestic money. The **sterilized intervention** is a situation in which the central bank first buys (or sells) foreign exchanges in the foreign exchange market then offsets the increase (or decrease) in the domestic monetary base by

selling (or buying) domestic bonds. The sterilized intervention leaves the domestic monetary base unchanged. Many developed countries, such as the United States and Japan, fully sterilize their foreign exchange market interventions as a matter of routine. The monetary approach we discussed before suggests the complete sterilized intervention in the foreign exchange market is ineffective, because it leaves the exchange rate unchanged. For example, if PBOC, China's central bank adopts expansionary monetary policy so that domestic money stock increases by ¥100 million, the value of domestic currency will go down because of the excess supply. To maintain the exchange value of the domestic currency (RMB) in the foreign exchange market, the central bank has to sell the foreign exchanges for domestic currency. Suppose the PBOC needs to sell $15 million to maintain the current exchange rate of ¥6.5/$. The bank also buys ¥97.5 million at the same time. If it is a fully intervention which entails an open market purchase of domestic securities, the PBOC will buy domestic securities by the equivalent amount which is ¥97.5 million. Thus the domestic monetary base is the same as before. The value of the domestic currency still faces down pressure in the foreign exchange market.

However, the portfolio balance approach postulates the sterilized intervention is effective. For example, if central bank buys foreign currency to maintain the exchange rate, it actually buys foreign-currency-denominated financial instruments such as foreign bonds. The increase in the quantity of foreign bonds demanded causes the depreciation of the domestic currency because of the excess money supply. The central bank then sterilizes the intervention through an open-market sale of domestic bonds, reducing domestic credit, and leaving the domestic monetary base unchanged. However, the increase in the supply of domestic bonds and the demand for foreign bonds lowers the domestic interest rate and raises the exchange rate. Thus, sterilized intervention can be effective.

Some economists believe that intervention in the foreign exchange market, whether sterilized or non-sterilized, will have immediate effect on exchange rate. This is because the intervention itself delivers an important signal to the market that the current exchange rate is not what the monetary authority wants to be. This is called **announcement effect** or **signaling effect** of the intervention. For example, if the central bank sells foreign exchanges in the foreign exchange market, the currency traders have reasons to anticipate appreciation of the

domestic currency. They will reduce their holdings of the foreign currencies. If most people believe it is true, they will sell the foreign currencies and cause an actual appreciation of the domestic currency. Several empirical studies conducted by some economists found evidence that the announcement effect does affect the exchange rates. The sizable interventions like those in the 1980's have larger effects on exchange rates than the actual magnitudes of the interventions themselves, especially in the short-run.

Summary

1. The Cambridge equation shows people hold a fraction of their nominal incomes as money balances. It also shows that the money demand depends on price level and real income.
2. A country's money supply is composed of domestic credits and foreign exchange reserves.
3. When the money demand is greater than money supply, BOP has surplus; if the money demand is less than money supply, BOP runs deficit.
4. Under the fixed exchange rate system, expansionary monetary policy leads to BOP deficit; central banks intervention in the foreign exchange market brings back the BOP equilibrium.
5. Under the floating exchange rate system, BOP disequilibrium is corrected by the changes in exchange rate.
6. The monetary approach in a two-country model shows that the exchange rate is determined by the related countries' money supply, economic growth rate and the ratio of desired money balance to income.
7. The portfolio balance approach expands the monetary approach by adding domestic money, domestic bonds and foreign bonds in its model. In the short-run, the exchange rate is determined by the changes in domestic money supply, domestic financial instruments and foreign financial instruments.
8. The demand to hold money is positively related to the income and wealth, negatively related to the domestic interest rate and negatively related to the expected rate of return on foreign bonds. The money market schedule is upward- sloping from left to right in the exchange rate-interest rate plane.
9. The demand for domestic bonds is positively related to the domestic interest

rate and wealth, negatively related to the expected rate of return on foreign bonds. The BB schedule is downward-sloping from left to right.

10. The demand for foreign bonds is positively related to the expected rate of return on foreign bonds and wealth, negatively related to the domestic interest rate. The B^fB^f schedule is also downward-sloping, but it is flatter than the BB curve. It shows that changes in the domestic interest rate affect the demand for domestic bonds more than they do on the foreign bonds.
11. Changes in the demand or supply of money, domestic and foreign bonds will shift the relative schedules either to the left or right, resulting in the adjustment in the capital market.
12. Sterilized intervention means if the central bank buys (or sells) foreign exchange in the foreign exchange market, it sells (or buys) domestic bonds in domestic capital market with an equivalent amount of the domestic currency. The sterilized intervention leaves domestic monetary base unchanged. Non-sterilized intervention, on the other hand, changes the domestic monetary base.

Key Terms

Announcement effect (signaling effect) (公示效应)
Cambridge equation (剑桥方程式)
Monetary approach (货币论)
Monetary base (货币基数)
Monetary multiplier (货币乘数)
Money demand (货币需求)
Money supply (货币供应)
Non-sterilized intervention (非冲销式干预)
Portfolio balance approach (组合资产平衡论)
Sterilized intervention (冲销式干预)
Wealth identity (财富恒等式)

Questions

1. Define the elasticity of export demand and the elasticity of import demand.

2. How does a currency depreciation or devaluation affect a nation's balance of trade according to the elasticity approach?
3. What is Marshall-Lerner condition? Do recent empirical studies suggest that world elasticity conditions are sufficiently high to permit successful depreciations or devaluations?
4. Define the terms of trade. How does a devaluation affect the terms of trade for devaluing country?
5. What is J-curve effect? Why does J-curve occur after devaluation?
6. How do elasticities of supply and demand for imports and exports affect the supply and demand for foreign exchange?
7. According to the absorption approach, does it make any difference whether a nation devalues its currency when the economy operates at less than full capacity versus at full capacity?
8. How can devaluation-induced changes in household money balances promote BOP equilibrium?
9. Distinguish among the three approaches to balance-of-payments adjustment.
10. How does the exchange rate change if the increase in country A's money supply exceeds that in country B's money supply according to the monetary approach?
11. Describe the portfolio balance approach. What is the difference between the monetary approach and the portfolio balance approach?
12. What determines the exchange rate in the short-run according to the portfolio approach?
13. Explain the sterilized intervention. Does sterilized intervention affect exchange rate according to the portfolio balance approach?
14. Illustrate the RMB exchange rate using the supply and demand framework. Explain the effect of the PBOC open sales of government bonds on the exchange value of the RMB.
15. Write out a wealth identity for both the Chinese economy and the U. S. economy. Using this identity, explain the impact of an open market sale of bonds by Feds in U. S. on the exchange value between the RMB and U. S. dollar.

CHAPTER 10
MACROECONOMICS IN AN OPEN ECONOMY

LEARNING OBJECTIVES

- Review the basics of macroeconomics such as the consumption function, the marginal propensity to consume, the marginal propensity to save and the marginal propensity to import
- Introduce the IS, LM and BP curves in an open economy
- Examine the impacts of fiscal and monetary policies on aggregate output or income
- Establish the IS-LM-BP model

Now we are going to survey macroeconomics in an open economy. In a closed economy, markets are finding an equilibrium of both the goods market and money market. In an open economy, the foreign exchange market should also be in equilibrium. As we discussed in Chapter 2, a country's balance of payments is linked to domestic saving, investment and output. In this chapter, we will discuss a general framework for analyzing the performance of an economy that is open to the rest of the world. We will also examine the conditions that all the three markets reach equilibrium together.

We first review and outline some basic concepts of macroeconomics. We will derive IS curve, LM curve, and BP curve in an open economy. We then use them to see how changes in government purchases (G) (the part of the fiscal policy) and the money supply (M) (the part of the monetary policy) affect the equilibrium values of aggregate output (income) and the interest rate. Finally, we will establish the IS-LM-BP model.

The Aggregate Demand for the Aggregate Output

An open economy includes four groups: (1) households, (2) firms, (3) government, and (4) the rest of the world. The households and firms together comprise the private sector. The government is the public sector and the rest of the world is called international sector. These four groups interact in three markets: (1) goods market, (2) money (financial) market, and (3) foreign exchange market. A healthy economy needs all markets to be in equilibrium, that is to say, the supply should be equal to demand in all markets. If the markets are in disequilibrium, an economy will face a lot of problems such as inflation, unemployment and recession etc. In the case of open economy, it also needs to address the problem of external balance. How does an economy achieve equilibrium? What are the equilibrium conditions for all the markets? Before answering these questions, we have to expand the discussion of the closed economy in the macroeconomics to take into account the exports and imports market.

The Consumption Function

A nation's aggregate output is called the **gross domestic product**, or GDP. The GDP can be regarded as the total demand for goods and services by the four groups of the economy. If Y denotes the aggregate output, we can write Y as

$$Y \equiv C + I + G + X - M$$

This identity defines Y as the sum of consumption, plus investment, plus government spending, plus exports, minus imports. The right side of this identity represents **aggregate demand** for aggregate output. The first three terms, consumption (C), investment (I) and government spending (G) – constitute the domestic demand for goods and services. For an open economy, we need to subtract imports and add exports.

Now let's review the determinants of the consumption (C) which is the largest part of aggregate demand. It refers to personal consumption expenditures. Consumption decisions mainly depend on income. The income is actually the **disposable income** which is the after-tax income. There is a positive relationship between the consumption and disposable income.

Let Y_d denote disposable income, we can then write:

$$C = C\ (Y_d) \tag{10.1}$$

This is the consumption function. It shows when disposable income goes up, so do consumption expenditures. Since this equation captures behavior of consumers, it is also called **behavioral equation** by some economists.

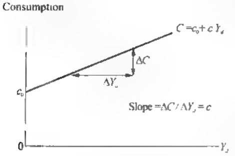

Figure 10.1 Consumption and disposable income

For simplicity, assume that points of total consumption, when plotted against total disposable income, lie along a straight line, as in **Figure 10.1**. Because the consumption function is a straight line, we can write the following equation to describe it:

$$C = c_0 + c_1\ Y_d \tag{10.2}$$

Y_d is the disposable income, C is the total consumption, and c_0 is a point at which the consumption function intersects the vertical axis. The constant c_0 means people would consume if they don't have disposable income in the current year. c_0 is also called **autonomous consumption**. c_1 is the slope of the function. It is called **marginal propensity to consume** (**MPC**) which measures the increased consumption due to the increased disposable income. For example, an MPC of .85 means an increase in income of ¥100 would then increase consumption by ¥85.

The Saving Function

People have their disposable income either to be spent or saved in a closed economy. If marginal propensity to consume is 85%, it implies that people will save 15% of their additional disposable income. The **marginal propensity to save** (**MPS**) is the fraction of a change in income that is saved. It is defined as $\Delta S/\Delta Y_d$. The saving function is pictured in **Figure 10.2**. Saving is also

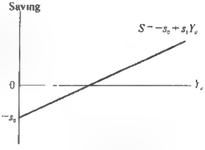

Figure 10.2 Saving and disposable income

positively related to the income. In the figure, s_0 is a point at which the saving function intersects the vertical axis. When people don't have income in the current period, they have to borrow or withdraw their saving to spend. s_0 is called **dissaving**. In this case, they don't have saving, their saving is negative. s_1 is the MPS.

The Investment and Government Spending, Exports, and the Imports Function

The determinants of investment (I) and government spending (G) are related to the aggregate output or income. As we know, the investment is also a function of interest rate. The government spending may not depend only on aggregate output, because governments do not behave with the same regularity as consumers or firms. Here we take investment and government spending as given to keep our model simple. Now let us consider exports and imports in an open economy.

Exports represent demand for domestic products not by domestic households and firms and the government but by the rest of the world. Changes in domestic aggregate output or income have no direct impacts on exports. We also take exports as given. Imports are not a part of domestic output. When we calculate total private sector's consumption spending and investment spending, and government spending, imports are included. Therefore, to calculate aggregate output correctly, we must subtract the parts of consumption, investment, and government spending that constitute imports.

The same factors that affect people's consumption and investment behavior are likely to affect the demand for imports. Therefore, the demand for imports is basically the function of income. Higher domestic income leads to a higher domestic demand for all goods, both domestic and foreign. Imports are often used as inputs into the production of the goods and services that constitute the domestic product. So, a higher domestic income leads to higher imports. The **marginal propensity to import** (MPM) is the increase in imports for the increase in income. The marginal propensity to import is closely related to the marginal propensity to save. MPS tells us what fraction of an additional unit of income is not spent but leaks into saving. MPM tells us how much of additional output and income leaks into imports. Keep in mind that the sum of three marginal propensities *MPC*, *MPS*, and *MPM* equals to 1. That is,

$$MPC + MPS + MPM = 1 \tag{10.3}$$

The Total Spending Line

Now if we put together all the components of the demand for aggregate output, we derive the total spending line in **Figure 10.3** — that line plots the various components of demand against output. Assuming for simplicity that investment spending, government spending and exports are all constant and do not depend on income, we just add the fixed amount of I, G, and X to consumption at every level of income. Here, we assume that $(I + G + X)$ equals 100. The slope of this line is determined by the MPC. An increase in output results in an increase in spending but less than one for one.

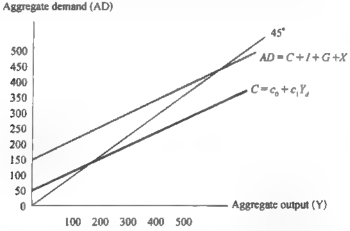

Figure 10.3 The demand for domestic products and import

However, the line $(C + I + G + X)$ includes spending on imports, which are not part of domestic production. To get spending on domestically produced goods and services, we must subtract the amount that is imported at each level of income. **Figure 10.4** plots the spending line in an open economy $(AD = C + I + G + X - M)$. We assume the marginal propensity to import equals .15, which is the assumption that 15 percent of total income is spent on goods and services produced in foreign countries. Imports under this assumption are a constant fraction of total income; therefore at higher levels of income a larger amount is spent on foreign goods and services. For example, at $Y = 300$, $M = .15Y$, or 45. Similarly, at $Y = 400$, $M = .15Y$, or 60. The slope of spending line $(C +$

$I + G + X - M$) is less than the slope of the domestic demand line ($C + I + G + X$). As GDP and total incomes rise, spending on consumption rises by the income change times the *MPC*. At the same time, spending on imports also rises. Suppose aggregate output increases by \$300 and *MPC* equals .80. Spending on consumption increases by \$240, of which imports increase by \$45 because the *MPM* is .15. Hence spending on domestic goods rises by only \$195 (\$240 − \$45), and the slope of total spending line falls from .8 to \$195/\$300 = 0.65.

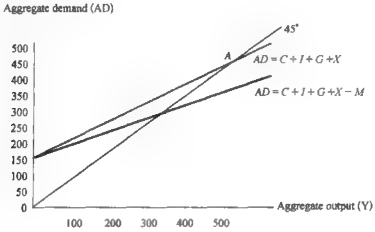

Figure 10.4 The spending line in an open economy

When aggregate output (income) equals aggregate demand (total spending), the economy reaches equilibrium. The figure shows that the equilibrium point is point A. If Y is below \$300, spending would exceed output, inventories would be lower than planned, and output would rise. At levels above \$300, output would exceed planned spending, inventories would be larger than planned, and output would fall.

IS, *LM* and *BP* Curves in an Open Economy

The IS Curve

We assumed the investment as given in the previous model. We now relax this assumption and introduce a more realistic treatment of investment. Investment is actually a function of interest rate. There is a negative relationship between the

investment and interest rate. A fall in interest rate is likely to raise investment spending and a rise in interest rate may cut investment expenditure. **Figure 10. 5** depicts the investment spending line. The investment spending line is downward sloping from left to right. If interest rate falls from 4% to 3%, investment spending rises from $200 to $300. We can derive the *IS* curve from the relationship between investment and interest rate.

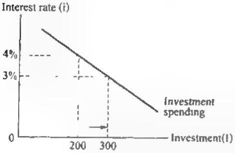

Figure 10. 5 Investment spending curve

Increased investment spending means more outputs. Thus there is also a negative relationship between aggregate output and interest rate. This is shown by ***IS* curve** (*IS* stands for investment — saving) in **Figure 10. 6**. In domestic goods market, there is an equilibrium level of aggregate output (Y) for each value of the interest rate (*r*). For a given value of *r*, we can determine the equilibrium value of *Y*. Therefore, each point on the *IS* curve represents the equilibrium point in the goods market for the given interest rate. Changes in any components of the aggregate demand shift the *IS* curve either to the left or the right. For example, increase in government spending which is a part of the **fiscal policy** leads to the right shift of the *IS* curve. This is because when government purchases increase with a constant interest rate, the equilibrium value of *Y* increases. With the same value of *r* and a higher value of *G*, the equilibrium value of *Y* is larger; when *G* decreases, the *IS* curve shifts to the left. In the figure, with a given interest rate *r*, the increase in government spending shifts *IS* curve to *IS'*, the equilibrium value of *Y* increases from Y_0 to Y_1.

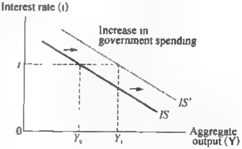

Figure 10. 6 The IS curve

The LM Curve

Let's now turn to the money market. The interest rate which is the price of

money is determined by the supply of and the demand for money. Money demand is a decreasing function of the interest rate (r). An increase in the interest rate decreases the demand for money, as people put more of their wealth into savings. On the other hand, the lower the interest rate, the higher the amount of money people want to hold. The relation between the demand for money and interest rate is shown in **Figure 10.7**. The vertical axis measures the interest rate, i. The horizontal axis measures the quantity demanded for the money, M.

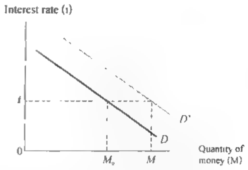

Figure 10.7 The demand for money

For a given interest rate, an increase in income (Y) increases the demand for money. The reason for this is that when Y increases, the demand for money increases because more money is demanded for the increased volume of transactions in the economy. In other words, an increase in income shifts the demand for money curve to the right. In the above figure, for example, at interest rate i, an increase in income from Y_0 to Y_1 increases the demand money from M_0 to M_1.

The positive relationship between the interest rate and income is depicted in **Figure 10.8**. This curve is called the ***LM* curve**. Each point on the LM curve represents equilibrium in the money market for the given value of aggregate output (income).

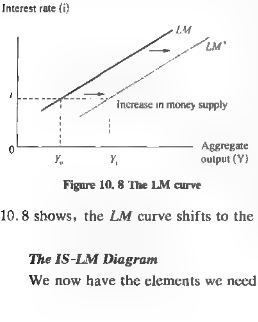

Figure 10.8 The LM curve

Now if central bank adopts expansionary **monetary policy** and thus with increasing money supply with a constant level of Y, the equilibrium value of r decreases. As the Figure 10.8 shows, the LM curve shifts to the right when money supply increases.

The IS-LM Diagram

We now have the elements we need to understand the movements of output

and the interest rate. We put together the *IS* curve and *LM* curve in

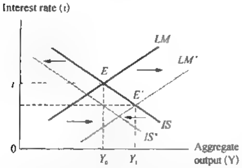

Figure 10.9 The *IS-LM* diagram

Figure 10.9. Since the *IS* represents the equilibrium in goods market and *LM* curve represents the equilibrium in money market, the intersection of the two curves shows both the goods market and money market reach equilibrium which is point *E*. At point *E*, equilibrium aggregate output (income) is attained simultaneously with the interest rate that maintains equilibrium in the money market. Expansionary monetary policy leads to decrease in interest rate and increase in output. *LM* curve shifts to the right to *LM'*. New equilibrium point will be *E'*. If government decides to raise the tax rates, the impact of this fiscal policy on the economy is the lower income and the lower interest rate. The *IS* curve thus shifts left to *IS'*. Therefore, the function of both the monetary policy and fiscal policy is to shift the *LM* and *IS* curve.

The BP Curve

Besides the goods market and money market, there is another market called foreign exchange market in an open economy. The equilibrium of the foreign exchange market means a balanced balance of payments. In chapter 2 we define the balance of payments (BP) as follows:

$$BP = CA + KA \tag{10.4}$$

where *CA* is the current account balance and *KA* is the capital and financial account balance. Since trade balance dominates the current account, net exports (X−M) are approximately equal to current account balance. The balance of payments depends on net exports and net capital flows. Take a look at **Figure 10.10** to see the balance-of-payments (BP) curve which shows

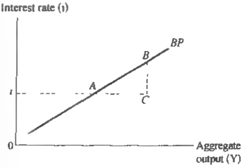

Figure 10.10 The BP curve

the set of aggregate output (Y) — interest rate combinations that maintains a balance-of-payments equilibrium.

The *BP* curve is upward-sloping. The reason is that higher levels of income cause a deterioration in the current account, which necessitates a reduced capital outflow or higher capital inflow requiring a higher interest rate. Any point below the *BP* curve represents minus net exports such as point *C* in the figure. In order to restore the BOP equilibrium, interest rate must rise. The higher interest rate attracts a greater inflow of capital, thereby improving capital and financial account balance. The point *B* is above and to the right of point *A*, and represents another income-interest rate combination consistent with a BOP equilibrium. Here we assume that the exchange rate is fixed. If the exchange rate is allowed to float, the position of the *BP* curve will be altered.

Both the *BP* curve and *LM* curve slope upward. Is the slope of the *BP* curve steeper or flatter than that of the *LM* curve? It depends on how responsive money demand and the BOP are to changes in the interest rate and aggregate output. If capital flows are very sensitive to interest rates, then the *BP* curve is relatively flat, flatter than the *LM* curve. This is because if BOP runs deficit, the interest rate needs to be raised a little to draw in enough capital to offset the deficit. On the other hand, if BOP runs surplus, only a small decrease in the interest rate is needed to flow out enough capital to erase the surplus. The *BP* curve, just like the *IS* curve and *LM* curve will shift either to the left or right. For instance, an increase in foreign income results in a rise of demand for our exports. The *BP* curve thus shifts to the right. A higher foreign interest rate causes a capital outflow from the domestic country, deteriorating the capital and financial account balance, and shifting the *BP* curve to the left.

Three Markets Together: The *IS* – *LM* – *BP* Model

Now we put together the three curves in the interest rate — aggregate output plane. If domestic goods market and money market reach equilibrium at the same time, we can judge the BOP status according to the position of the *BP* line. This is shown in **Figure 10.11**.

In Figure 10.11 (a), the *BP* curve passes through point A which is the intersection of the *IS* and *LM* curve. The three markets reach the simultaneous

equilibrium at this point. This is because point A on the *IS* curve and LM curve is also on the *BP* curve. The *BP* curve is steeper than the *LM* curve, but this need not always be the case. It may be flatter than the *LM* curve, depending on the degree of capital mobility internationally; the higher the degree of capital mobility, the flatter the *BP* curve.

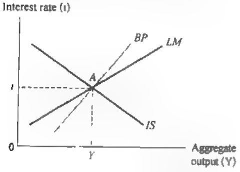

Figure 10.11(a) **Three markets reach equilibrium**

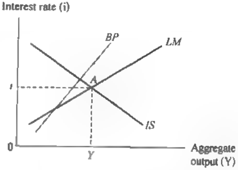

Figure 10.11(b) **BOP runs deficit while the domestic market reaches equilibrium**

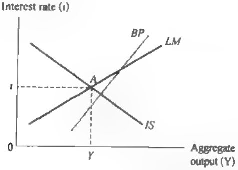

Figure 10.11(c) **The BOP runs surplus while the domestic market reaches equilibrium**

If the *BP* curve is above or on the left side of the equilibrium point *A*, BOP is in deficit. This is shown in **Figure 10.11 (b)**. It means the aggregate output level *Y* is too high or the interest rate *i* is too low, inducing an overall balance of payments deficit.

If the *BP* curve is below or on the right side of the equilibrium point *A* like the **Figure 10.11 (c)** shows, BOP is in surplus. This surplus comes about because the level of aggregate output is too low and /or the rate of interest is too high to

be compatible with overall equilibrium. The *IS-LM-BP* model is a useful tool for examining the determination of the equilibrium interest rate and equilibrium aggregate output level and the state of the balance of payments.

In the next chapter we will analyze the economic policies for tackling the problems in figure (b) and (c). The government can use the fiscal and monetary policies to adjust the interest rate level or income level to make the three markets in equilibrium. However, the policies for achieving the overall equilibrium in different exchange rate systems are different.

Summary

1. Households, firms, governments and the rest of the world interact in the three markets: goods market, money market and foreign exchange market. All the markets are required to reach equilibrium in an open economy.
2. Consumption is an increasing function of the disposable income. The slope of the consumption function is determined by the marginal propensity to consume (MPC) which is defined as the ratio of increased consumption divided by the increased income.
3. The marginal propensity to save (MPS) is the slope of the saving function. It measures the increased saving due to the increased disposable income.
4. The marginal propensity to import (MPM) tells you the extra money spent on imports when you have extra income.
5. *IS* curve shows all combinations of interest rate and aggregate output (income) that are equilibrium in the domestic goods market. *IS* curve slopes downward.
6. *LM* curve shows all combinations of interest rate and aggregate output (income) that are equilibrium in the domestic money market. *LM* curve slopes upward.
7. *BP* curve shows all combinations of interest rate and aggregate output (income) that result in a balanced BOP. It is also upward-sloping. The slope of this curve depends on the responsiveness of the BOP to the changes in interest rate.
8. The intersection of *IS* and *LM* curves is the equilibrium point at which domestic goods market and money market are in simultaneous equilibrium. If the *BP* curve is not on the intersection of *IS* and *LM* curves, the country's BOP is either in deficit or surplus. If *BP* curve is left to the

equilibrium point of the domestic goods and money market, *BOP* runs deficit; If *BP* curve is right to the equilibrium point of the domestic goods and money market, BOP is in surplus.

Key Terms

Aggregate demand (总需求)
Aggregate output (总产出)
Autonomous consumption (自主性消费)
Behavioral equation (行为方程式)
BP curve (国际收支曲线)
Disposable income (可支配收入,税后收入)
Dissaving (负储蓄)
Fiscal policy (财政政策)
Gross Domestic product GDP (国内生产总值)
IS curve (投资-储蓄曲线)
LM curve (货币需求-供应曲线)
Marginal propensity to consume MPC (边际消费倾向)
Marginal propensity to save MPS (边际储蓄倾向)
Marginal propensity to import MPM (边际进口倾向)
Monetary policy (货币政策)

Questions

1. Define the marginal propensity to consumption.
2. Suppose that an economy is characterized by the following behavioral equations:

$$C = 110 + 0.6\,Y_d$$
$$I = 120$$
$$G = 125$$
$$T = 125$$
$$X = 50$$
$$M = 30$$

Solve for

a. Equilibrium GDP (Y)

b. Disposable income (Y_d)
c. Consumption spending

3. How does the intersection of the IS and LM curves relate to the concept of domestic market balance?
4. Explain the effect of each of the following on the *IS* curve:
   a. Government adopts expansionary fiscal policy
   b. Foreign demand for the country's exports increases
   c. The country's central bank carries out contractionary monetary policy
5. Explain the effect of each of the following on the *LM* curve:
   a. The country's central bank increases the money supply
   b. The country's interest rate decreases
6. Explain the effect of each of the following on the *BP* curve:
   a. Foreign taste for the domestic exports changes unfavorably
   b. Foreign country expands its money supply
   c. Domestic interest rates fall
7. Why might investment not respond positively to low interest rates during a recession? Why might investment not respond negatively to high interest rates during a boom?
8. What is the impact on *IS* - *LM* curves if the Congress decides to cut government spending while the central bank expands money supply?
9. Illustrate with *IS* - *LM* curves if government increases its spending while the central bank changes money supply by enough to keep interest rates constant.
10. "Along the consumption function, income changes more than consumption." What does this imply for the *MPC* and *MPS*?
11. True or false for the following statement: "A budget deficit is bad because it leads to rapid monetary growth." Explain.
12. What determines the slope of the *BP* curve? List several causes that will shift the *BP* curve.
13. How can you tell that a country is in BOP surplus or deficit according to the position of the *BP* curve?
14. What are the impacts of the increase in domestic product and income on the country's exports and imports?
15. What are the impacts of the decrease in foreign product and income on domestic country's exports and imports?

CHAPTER 11
ECONOMIC POLICY UNDER FIXED AND FLOATING EXCHANGE RATE SYSTEM

LEARNING OBJECTIVES

- Understand the macroeconomic goals in an open economy
- Review the monetary policy, fiscal policy and capital controls the government can use to influence the economy
- Examine the monetary and fiscal policy on the economy under the fixed exchange rate system with imperfect or perfect capital mobility
- Consider a two-country model with perfect capital mobility under fixed rate system
- Know the characteristic of the *BP* curve under the floating exchange rate system
- Explore how the internal and external goals are achieved under the floating exchange rate system with imperfect or perfect capital mobility
- Study a case of two-country with perfect capital mobility under floating rate system

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In previous chapters we studied several international financial theories. In chapter five, we learned some influential exchange rate theories and in chapters eight and nine we examined the classical and modern balance-of-payments theories. Economic theories help us understand how the world works, but the formulation of economic policy requires a second step. We must have objectives. What do we want to change and why? Do we need a high economic growth rate with a low inflation rate and high employment rate? Or do we need balanced balance of payments? If we need all of those, what can the

government do? In other words, what kind of economic policies should the government make to achieve the goal? The striking change over the 20th century was the discovery and application of macroeconomics, along with a good appreciation of the role and limitations of monetary and fiscal policy. Based on the macroeconomic framework we presented in chapter ten, we shall, in this chapter, address how both exchange rate changes and microeconomic policies impact on an open economy. The main difference between an open economy and a closed economy is that over time a country has to ensure that there is an approximate balance in its current account. Over the long-run, no country can run persistent BOP deficit. Conversely, it does not make sense for a country to run continuous BOP surplus. Therefore, the ultimate goal of the government is to achieve both internal and external balance.

First we introduce the macroeconomic goals an economy tries to achieve. We then examine the monetary policy, fiscal policy and the policy of capital mobility that the government uses to influence the economy. Next we analyze how the appropriate policy mix can be used under the fixed exchange rate system to achieve the desired economic goals. The defense of a fixed exchange rate through foreign exchange market intervention dramatically affects the country's monetary policy. Finally, we examine the function of policy mix under the floating exchange rate system.

Macroeconomic Goals in an Open Economy

Four of the major goals of macroeconomics are low inflation rate, low unemployment rate, sustainable growth rate and balanced balance of payments.

Inflation is an increase in the overall price level. The price level is a weighted average of the prices of the different goods and services in an economy. The most widely used measure of inflation is the **consumer price index (CPI)** which is a weighted average of the prices of a basket of goods and services consumed in a country. Inflation affects income distribution. Retirement pensions in some countries do not keep up with the price level. During the high inflation period, retirees lose in relation to other groups. Inflation also leads distortions and uncertainty in the economy. Price variations lead to more uncertainty, making it harder for firms to make decisions about

the future, such as investment decisions. A decrease in the overall price level is called **deflation**. High deflation creates many of the same problems as high inflation. Deflation can limit the ability of monetary policy to affect output. The goal of policy makers is to avoid prolonged periods of deflation as well as inflation in order to pursue the macroeconomic goal of stability. Keeping inflation low has long been a goal of government policy. Especially problematic are **hyperinflations** , or periods of very rapid increases in the overall price level.

Unemployment is the proportion of workers who are not employed or are looking for jobs. Unemployment rate is the ratio of the number of people who are unemployed to the number of people in the labor force. The unemployment has direct effects on the welfare of the unemployed. Also the unemployment signals that the economy may not be using some of its resources efficiently. If unemployment is very high, and many people who want to work do not find jobs, this suggests there is something wrong with the way the economy operates.

Economic growth refers to the growth in the productive potential of an economy. The productive potential is the central factor in determining the growth in its real wages and living standards. If output grows faster than the population, output per capita rises and living standards increase. Some government policies discourage economic growth and others encourage it. One of the examples is the tax laws which can be designed to encourage the development and application of new production techniques. In some countries, research and development are subsidized by the government. In developing countries, government may encourage the construction of public facilities such as roads, highways, bridges and transport systems because it may speed up the process of economic growth.

Those three major goals in an open economy are categorized as the goal of achieving **internal balance** , which is the overall balance in domestic markets.

Balance-of-payments equilibrium is a country's **external balance** , which is usually defined as the achievement of a reasonable and sustainable balance of payments with the rest of the world. The goal toward BOP equilibrium under the different exchange rate system may be different.

All economies face inevitable tradeoffs among these goals. Government plays a role in influencing the economy mainly through the fiscal policy,

monetary policy, the policy of capital controls and all other policies.

Monetary Policy, Fiscal Policy and Capital Mobility

Monetary Policy

The monetary policy is used by the government or central bank to control the money supply or to influence the economy. The target of monetary policy includes the achievement of a desired level of economic growth, the domestic price, the exchange rate, or the balance of payments. Three methods of monetary policy are widely used by a central bank to control the money supply. A central bank can buy and sell securities to adjust the money supply. The **required reserve ratio** effectively determines how much a bank has available to lend since required reserve ratio establishes a link between the reserves of the commercial banks and the deposits that commercial banks are allowed to create. The **discount rate** is the interest rate commercial banks pay the central bank. When a central bank lowers the discount rate, it encourages the commercial banks from borrowing from it. If a central bank wants to curtail the growth of the money supply, it raises the discount rate.

The central bank carries out either expansionary or contractionary monetary policy in the different stages of the economy. If the economy is in recession, an **expansionary monetary policy** will be conducted. The central bank purchases securities from the public, which pushes up the price of securities, expands the money supply and leads to a fall in the interest rate. The central bank can also reduce the reserve requirement to the commercial banks, which increases commercial banks' loanable funds, allows them to create more deposits. The lower interest rate and increased money supply stimulate the investment and thus increase the aggregate output (income). As far as the balance of payments is concerned, the increased income increases consumption including imports and thus deteriorates the current account. On the other hand, the lower interest rate speeds up the capital outflows. On the whole, the expansionary monetary policy leads to the BOP deficit.

If the economy grows too fast, the central bank can use **contractionary monetary policy** to cool down the overheating economy. The central bank sells the securities in the market, which pushes down the price of securities, reduces

money supply and thus increases the interest rate. The central bank may raise the reserve requirement ratio, so that the commercial banks do not have enough funds to lend. The results of the contractionary monetary policy are the decreased money supply and higher interest rate. It leads to less investment and a fall in aggregate output (income). The country's balance of payments will improve because of the fall in imports and the rise in capital inflows.

Fiscal Policy

Fiscal policy refers to the use of taxation and government spending to influence the economy. The government can change tax rates or set the rules about liability to tax to affect economy activities. It can also change its spending on goods and services or transfer payments to influence the total output. Like the monetary policy, fiscal policy can also be categorized as expansionary and contractionary. An **expansionary fiscal policy** aims at stimulating aggregate output (income). It refers to an increase in government spending or a reduction in tax rates. When the economy is depressed or the investment and employment are below normal, this policy is likely to be advocated. This policy may have consequences in the future. A reduction in tax revenue and increase in government spending expand the government debt which stores up the trouble for its successors. As far as the balance of payments is concerned, the expansion of the aggregate output will worsen the current account, but the higher interest rate attracts capital inflows and thus improves the capital and financial account. The results are ambiguous.

Contractionary fiscal policy aims at reducing aggregate output (income). The government cuts its spending or raises the tax rate to slow the economy. The effects of this policy are the opposite of the effects of an expansionary fiscal policy. A decrease in government spending or an increase in tax rate leads to a fall in aggregate output, a fall in the demand for money and a fall in the interest rate. However, the decrease in income is somewhat offset by the additional investment resulting from the lower interest rate. The contractionary policy is one of the important tools the government uses to fight inflation.

The Capital Mobility and BP Curve

The capital mobility is the extent to which capital can be shifted between

different countries. International capital mobility is frequently limited by government controls, in both capital-importing and capital-exporting countries. The capital mobility determines the slope of the *BP* curve and the slope of the *IS* curve, in turn, determines how monetary policy and fiscal policy ultimately influence a country's economic performance.

The slope of the *BP* curve is relative steep if the degree to which capital is allowed to flow across a nation's border is low. The low capital mobility arises because of capital controls or other impediments to flows of funds and assets. This is depicted in **Figure 11.1**. When aggregate output expands from Y_0 to Y_1, the nation reaches point A. At point A, the nation runs BOP deficit which results from high income. In order to attract enough foreign capital inward flows, the nation must increase interest rate by a sizable amount, from i_0 to i_1 to restore BOP equilibrium.

Compare to Figure 11.1, **Figure 11.2** shows the *BP* curve is flatter. In this case, the degree to which capital is allowed to flow between nations is high. In other words, there are fewer restrictions on the capital movements between the nations. A nation with high capital mobility is much easier to restore its BOP disequilibrium because a little higher interest rate will cause foreign capital inflows. The spread between i_1 and i_0 in this case is much smaller than the spread of $(i_1 - i_0)$ shown in Figure 11.1.

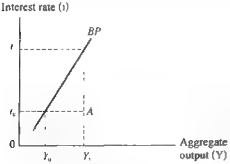


Figure 11.1 The BP curve with low capital mobility

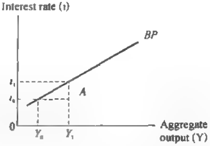


Figure 11.2 The BP curve with high capital mobility

The perfect capital mobility refers to a situation when capital is perfectly free to move between countries. For a small nation (one that is too small to influence global markets by itself), perfect capital mobility implies that the

uncovered interest parity must hold if the exchange rate is fixed. Otherwise, uncovered interest arbitrage will occur because any attempt to raise or lower the domestic interest rate leads to a massive capital inflow or outflow until the interest rate returns to the world interest rate level. Therefore, for a small country the perfect capital mobility means that domestic interest rate should be the same as the foreign interest rate and its *BP* curve is horizontal. This is shown in **Figure 11.3**. At point A, the country runs the BOP deficit resulting from the increased aggregate output (income) or the low interest rate. The interest rate now is lower than the world interest rate. In order to restore the BOP back to equilibrium, the central bank should increase domestic interest rate to prevent capitals from flowing out of the country. Therefore, the interest rate restores back to the initial level.

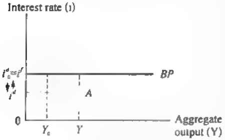


Figure 11.3 The BP curve with perfect capital mobility

Economic Policy under Fixed Exchange Rate System

The choice of exchange rate system reflects a country's priorities about the four economic goals we discussed in the first section of this chapter. The choice between fixed and floating rates may change over time as priorities change. From 1944 to 1971, the international monetary system was characterized by the fixed exchange rate regime. Even today, a lot of countries still peg their currencies to some hard currencies like the U.S. dollar, Euro and the British sterling pound etc. A number of countries have floating rates in name, but the exchange rates are so heavily managed by the governments that they are closer to being fixed rates in many respects. Therefore, it is still worth studing how a fixed exchange rate affects both a country's economy and the use of government policies to affect the economy's performance.

The Effect of Policy Mix under Fixed Exchange Rate and Imperfect Capital Mobility

We have learned so far monetary policy and fiscal policy in isolation. In

reality, the two are often used together. **Policy mix** refers to the combination of monetary and fiscal policies. The two policies can be used in the same direction or opposite direction. Look at the **Figure 11. 4**. Suppose a country adopts fixed exchange rate system and controls capital account transactions. The government now uses the expansionary fiscal policy in attempt to stimulate the consumption. The economy was originally in equilibrium at point A. The expansionary fiscal policy increases domestic interest rate and aggregate output level and *IS* curve thus shifts right to the new *IS'* curve. The economy achieves internal equilibrium since *LM* curve and *IS'* curve intersect at point B. Higher income leads to higher consumption including the imports spending. Even though the interest rate is up (from i_0 to i_1), the country is in *BOP* deficit and its currency has the pressure to depreciate in the foreign exchange market. Fixed exchange rate requires the government to defend the exchange rate so the central bank contracts the money supply which leads to the *LM* curve shifting left to *LM'*. The contractionary monetary policy increases the interest rate again from i_1 to i_2. Higher interest rate cuts part of the investment spending and aggregate output (from Y_1 to Y_2). Higher interest rate also attracts foreign capital inflow. Thus BOP improves. The economy restores back to the equilibrium at point C.

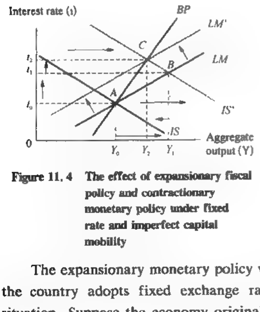


Figure 11. 4 The effect of expansionary fiscal policy and contractionary monetary policy under fixed rate and imperfect capital mobility

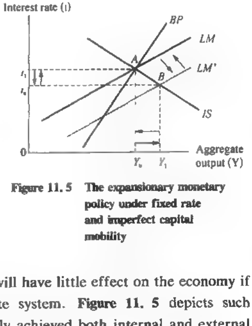


Figure 11. 5 The expansionary monetary policy under fixed rate and imperfect capital mobility

The expansionary monetary policy will have little effect on the economy if the country adopts fixed exchange rate system. **Figure 11. 5** depicts such situation. Suppose the economy originally achieved both internal and external

balance at point A. The central bank uses the expansionary policy so that interest rate is down and aggregate output is up. *LM* curve shifts to right and *BOP* deteriorates. The central bank is forced to sell foreign exchange reserves in the foreign exchange market in order to defend the fixed parity. The central bank then buys back the domestic currency so that *LM'* curve shifts back to *LM*. Hence, using only a single policy instrument, in this case the monetary policy is proved to be nullified. The economy's equilibrium point is again at point A. The central bank can of course pursue a sterilization intervention so that *LM'* curve remains at *LM'*, but that is not likely to last for long since finally the foreign exchange reserves will be depleted.

The conclusion is that the monetary policy which aims to influence the economic activities is ineffective if exchange rates are fixed. Fiscal policy is more powerful than monetary policy in terms of affecting the aggregate output and balance-of-payments status. The following small country's case also proves that fiscal policy exerts its largest feasible effects on equilibrium aggregate output (income) if the small country adopts fixed rate system and allows free capital movement.

A Small Country with Perfect Capital Mobility

In the early 1960's, Mundell and Fleming examined the implications of high capital mobility for a small country. For a small country changes in its interest rate and aggregate output have negligible repercussions for other countries. Therefore, for a small country, the choice of exchange rate system would have radical implications concerning the effectiveness of monetary and fiscal policy in influencing the level of economic activity.

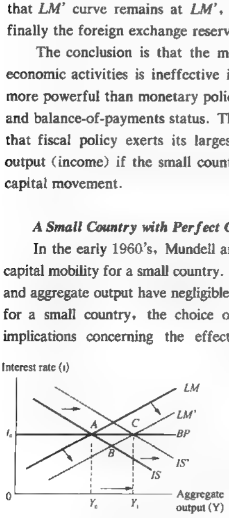


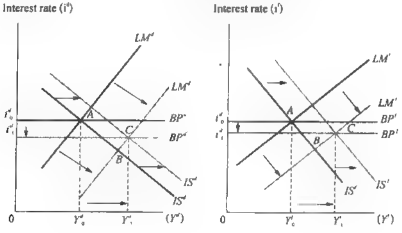
Figure 11.6 Fixed exchange rate and perfect capital mobility in a small economy

Figure 11.6 depicts the effects of monetary and fiscal expansion in a small open economy that adopts fixed exchange rate regime and has no restrictions on the capital mobility. The *BP* curve is horizontal because the domestic interest rate equals to the foreign interest rate. The economy is at initial equilibrium point A. The central bank increases its money

supply which leads LM curve to shift to the right. At point B, domestic interest rate is lower than foreign interest rate. This induces significant flows of capital out of the small open economy, which results in a balance-of-payments deficit. If the central bank intervenes in the foreign exchange market to prevent domestic currency from depreciation, the resulting decline in foreign exchange reserves ultimately causes the country's money stock to fall back to its original level. However, an expansionary fiscal policy is a good solution for this small open economy. The increased government spending shifts the IS curve rightward. Thus, the interest rate rises back to i_0 which improves its BOP status. The monetary policy alone is ineffective because the exchange rate is not allowed to change. However, the combination of expansionary monetary and fiscal policy increases the aggregate output (income) from Y_0 to Y_1.

The Effects of Foreign Economic Policy on the Domestic Economy: A Two-country Model

The economic powers such as the United States and Japan play the role of locomotive in the world economy, which means the performance of their economy deeply affects the economic activities of the rest of the world. The following example shows how the economic policy in the United States affects another country. **Figure 11.7 (b)** represents the foreign economy (U. S. economy) and **Figure 11.7 (a)** is the domestic economy (Canada).



(a) (b)

Figure 11.7 The locomotive effect of the foreign expansionary monetary policy

Suppose the U.S. Fed expands the money stock under the fixed exchange rate regime. The increased money stock shifts LM^f curve rightward to $LM^{f'}$ and causes the U.S. interest rate to fall. With the lower interest rate and high income at point B in panel (b), the U.S. runs BOP deficit. Canada is the major trading partner of the United States. When the U.S. runs trade deficit, Canada possibly has the BOP surplus. Because the exchange rate is fixed, the Canadian central bank must intervene in the foreign exchange market to buy the U.S. dollar. The Canadian central bank is thus forced to expand the supply of Canadian dollar. The LM^d curve shifts to the right which is shown in panel (a). At the point B, the domestic market is not at equilibrium and the interest rate is lower than that in U.S. The Canadian government adopts expansionary fiscal policy to cooperate with the expansion of the money supply. The IS^d curve thus shifts to the right. In U.S. increased income spurs aggregate spending, IS^f curve shifts rightward correspondingly. The economy reaches new equilibrium point (point C in the figure). The Canadian interest rate now is consistent with the U.S. interest rate and its economy restores back to equilibrium.

This example shows that foreign monetary expansion (the U.S. in this case) leads to a rise in both the foreign and domestic (Canada in this case) aggregate output (income) level. This is the so called "**locomotive effect**" which refers to the situation that income growth in one country leads to the income growth in another country.

The fiscal policy of the foreign country also has the impacts on the domestic economy. Unlike the monetary policy, the foreign expansionary fiscal policy increases foreign income at the expense of income decline in domestic country. In this case the foreign country plays the role of beggar-thy-neighbor. **Figure 11.8** depicts how the beggar-thy-neighbor works.

Again panel (b) represents the foreign economy (U.S.) and panel (a) denotes the domestic economy (Canada). The expansionary fiscal policy in U.S. increases both the U.S. aggregate output (income) and interest rate. The higher interest rate in the U.S. economy attracts the flow of financial resources from Canada to U.S. Canada now probably runs the *BOP* deficit. In order to maintain the fixed exchange rate, Canadian central bank has to sell U.S. dollar for Canadian dollar, causing the domestic money stock to shrink. The domestic

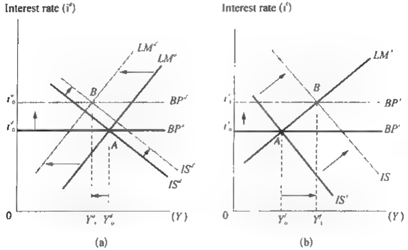


Figure 11.8 The beggar-thy-neighbor effect of foreign expansionary fiscal policy

LM^d curve thus shifts left to $LM^{d\prime}$. We find in the panel (a) the domestic aggregate (income) declines from Y_0^d to Y_1^d. Since the Canadian interest rate is still lower than that in U. S., the Canadian government may increase its spending expenditure to stimulate the domestic consumption. The IS^d curve then shifts to the right. At the equilibrium point B, the domestic interest rate is the same as the U. S. interest rate. In this example, the U. S. expansionary fiscal policy is a **beggar-thy-neighbor** policy. The rise in U. S. aggregate output (income) is at the expense of income decline in Canada.

Economic Policy under Floating Exchange Rate System

After the collapse of the Bretton Woods system in the beginning of 1970's, the major currencies began to float against each other. Today many industrialized countries let their currencies float. The floating exchange rate system means the government has no obligation to defend the exchange rate. When a country has BOP deficit, the country's currency depreciates in the foreign exchange market. If a country runs BOP surplus, its currency appreciates. The BP curve, therefore, shifts rightward in case of the deficit and leftward in case of the surplus.

The Effects of Monetary Policy and Fiscal Policy under Floating Exchange Rate System

Figure 11.9 describes the situation that the central bank uses expansionary monetary policy under the floating rate system. The economy reaches initial equilibrium point A. The expansionary monetary policy leads the LM curve to shift to the right. With the lower interest rate and higher aggregate output, borrowing and spending rise which results in the shift of IS curve to IS'. Two possible causes lead the country's BOP to deteriorate. First, the drop in interest rate tends to worsen as capital flows out of the country. Second, the rise in income tends to worsen the current account as imports rise. The exchange rate of the domestic currency depreciates in the foreign exchange market. Then the BP curve shifts to the right. At the point C, the balance-of-payments equilibrium is achieved. Therefore, under floating exchange rate system, monetary policy exerts a strong influence over domestic aggregate output (income).

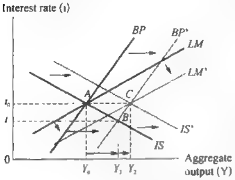


Figure 11.9 The effects of expansionary monetary policy under floating rate system

The effects of fiscal policy alone on the economy are a little more complicated if the exchange rate is allowed to change. The rise in income and value of its currency depends largely on the country's capital mobility. The extent of the rise in income declines as the degree of capital mobility rises. **Figure 11.10** shows the effects of the fiscal policy on the economy.

In panel (a) of the **Figure 11.10** the BP curve is steeper than the LM curve, which means the capital mobility is low. The expansionary fiscal policy shifts IS curve right to IS'. At point B, interest rate is high and output increases. Since the capital mobility is low, high interest rate does not attract capital inflows. On the other hand, high income induces more spending including imports; the current account deteriorates and BOP moves into deficit. In turn, the deficit leads to a depreciation of the domestic currency in the foreign exchange market. The depreciation of the domestic currency induces net export

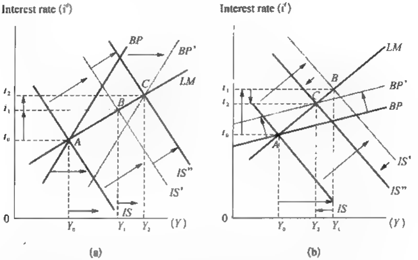


Figure 11. 10 The effects of fiscal policy under floating exchange rate system

expenditures to increase resulting in the *IS'* shifting rightward once more. At the same time *BP* curve also shifts to the right. The final equilibrium with a balanced BOP reaches at point *C*. The impacts of the expansionary fiscal policy are the increased aggregate output (income) and the decreased value of the domestic currency in the foreign exchange market.

In panel (b), because of high capital mobility the *BP* curve is flatter than the *LM* curve. Initially, the expansionary fiscal policy leads to higher interest rate and high aggregate output (income). This time the higher interest rate attracts foreign capital inflows. Point *B* which is the internal equilibrium point falls above the *BP* curve. With capital inflows, the country's capital account improves. The demand for domestic currency in the foreign exchange market rises, causing the appreciation of the domestic currency. The appreciation of the domestic currency results in reduction of exports. Therefore, *IS'* curve shifts leftward to *IS"*, *BP* curve also shifts to the left. The net impacts of the expansionary fiscal policy are higher interest rate and higher aggregate output (income), but the income level is lower than that in panel (a) because of the high capital mobility.

A Small Country with Floating Rate and Perfect Capital Mobility

Now let's examine the effects of economic policy on a small country with

floating exchange rate and perfect capital mobility. In the case of perfect capital mobility, any attempt to raise the domestic interest rate in a small country leads to a massive capital inflow to purchase domestic securities pushing up the price of securities until the interest rate keeps the same as the world interest rate. When the domestic interest rate is lower than the world interest rate, there is massive capital outflow to sell domestic securities for foreign securities until the interest rate goes up.

Panel (a) of **Figure 11. 11** shows the impacts of expansionary monetary policy and panel (b) describes the expansionary fiscal policy. Just like the case of the floating rate with imperfect capital mobility, the expansionary monetary policy exerts a strong effect on the economy. Panel (a) shows that both *LM* and *IS* curves shift to the right, and *BP* curve keeps as the same before. Aggregate output (income) increases as fully as possible, from Y_0 to Y_2.

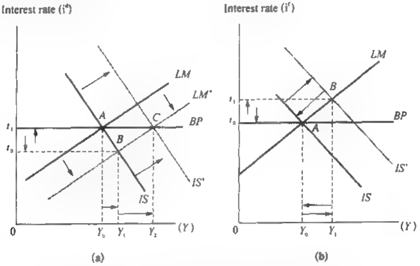


Figure 11. 11 The effects of economic policy under floating exchange rate system with perfect capital mobility

In panel (b) of **Figure 11. 11** , the expansionary fiscal policy is nullified if the capital mobility is free. The domestic interest rate is higher than the world interest rate. Capital inflows cause BOP surplus and appreciation of the domestic currency in the foreign exchange market. Consequently, export industry shrinks and *IS* curve shifts back to its initial level. On net, the expansionary fiscal policy has no effect on the aggregate output (income).

The Effects of Domestic Economic Policy on the Foreign Economy: A Two-country Model

We have examined the policy implications of one nation for the economy of another nation under the fixed exchange rate system. We apply the two-country model to a setting with floating exchange rate system in **Figure 11. 12**.

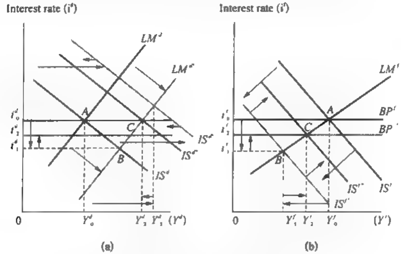


Figure 11. 12 The effects of the domestic expansionary monetary policy on the foreign economy

Panel (a) depicts a situation that domestic central bank expands the money stock. LM^d curve shifts to the right and equilibrium point moves from A to B. The lower interest rate induces the domestic financial resources outflows. The value of domestic currency declines in the foreign exchange market. The depreciation of the domestic currency plus the higher income spurs the expansion of the domestic expenditures on domestic output, so the IS^d curve shifts rightward. The impacts of the domestic expansionary monetary policy on the foreign economy are shown in **Figure 11. 12**, panel (b). A depreciation of the domestic currency implies an appreciation of the foreign currency. The appreciation of the foreign currency causes the foreign IS^f curve shift leftward. Foreign aggregate output (income) thus falls which directly affects domestic exports. When domestic exports decline, domestic IS^d curve shifts back a little bit. On the other hand, higher domestic income increases domestic expenditures on foreign imports, resulting in the rise of exports of the foreign country.

Therefore, the foreign IS^f curve shifts to the right. The equilibrium domestic interest rate converges to the foreign equilibrium interest rate. Both domestic and foreign BP curves shift downward. Clearly, this case shows the domestic expansionary monetary policy has a beggar-thy-neighbor effect on the foreign country. In other words, the increase in domestic income is at the expense of reduction in foreign income.

Finally, let's examine the impacts of domestic expansionary fiscal policy on the foreign economy.

Domestic country increases government spending as shown in panel (a) of **Figure 11.13**. Fiscal expansion lifts the domestic interest rate, which causes an inflow of financial resources from the foreign country. Domestic currency appreciates against the foreign currency. The appreciation of the domestic currency promotes the exports from the foreign country. In panel (b), foreign IS^f curve shifts to the right because of the increased expenditure on aggregate output. On the other hand, the domestic $IS^{d\prime}$ curve shifts left to $IS^{d\prime\prime}$ because of the reduction in exports expenditures. The net effect of the domestic expansionary fiscal policy is to increase both countries' aggregate output (income). The domestic fiscal policy is thus said to have locomotive effect on the foreign economy.

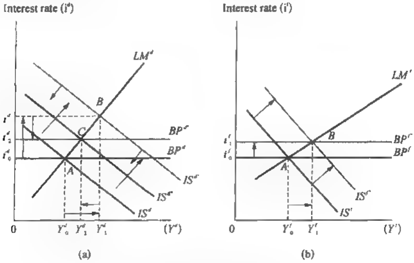


Figure 11.13 The effects of the domestic expansionary fiscal policy on the foreign economy

Summary

1. All economies face inevitable tradeoffs among the economic goals such as the low unemployment rate, low inflation rate, sustainable rate of economic growth, and balanced balance of payments.
2. The overall balance in domestic markets is a country's internal balance while the BOP equilibrium is a country's external balance.
3. Three methods of the monetary policy are purchase and sales of securities in the market, changes in the required reserve ratio and changes in the discount rate. An expansionary monetary policy leads to increase in money supply and decrease in interest rate, thus stimulates investment and results in a rise in output. BOP position may deteriorate. Conversely, a contractionary monetary policy contracts money supply and raises the interest rate. Investments shrink and output reduces. BOP will improve.
4. An expansionary fiscal policy is an increase in government spending or a reduction in tax rate aimed at increasing aggregate output (income). The effects of the expansionary fiscal policy on BOP are indeterminate. On the other hand, a contractionary fiscal policy is a decrease in government spending or a rise in tax rate aimed at contracting the economy.
5. Capital mobility determines the slope of the BP curve. The slope of the BP curve, in turn, determines the effectiveness of the monetary and fiscal policy. The slope of the BP curve with the low capital mobility is steeper than that with the high capital mobility. In the case of perfect capital mobility, the BP curve is horizontal.
6. The expansionary monetary policy has little effect on the economy if the exchange rate is not allowed to change. On the contrary, the expansionary fiscal policy is proved to be useful. The expansionary fiscal policy combined with the contractionary monetary policy can increase aggregate output (income) and keep the BOP equilibrium at the same time.
7. If a small country chooses fixed exchange rate system and puts no limitations on the capital movement, the country's interest rate must equal the foreign interest rate. The combination of both expansionary monetary and fiscal policy promotes the economic growth in the small country.

8. The locomotive effect means income growth in one country (usually the economic power) leads to income growth in another country. The beggar-thy-neighbor effect, on the contrary, is the situation that one country's income growth is at the expense of income decline in another country.
9. Under the floating exchange rate system, the monetary policy exerts strong influence on the economy while the impacts of the fiscal policy on the economy depend on the capital mobility. The lower the capital mobility of the nation, the more the aggregate output (income).
10. If a country does not control capital account transactions, the monetary policy is more powerful than the fiscal policy when the exchange rate is allowed to move freely. The fiscal policy alone is ineffective in the floating exchange rate system.
11. In a two-country model, if the exchange rate is allowed to float, domestic expansionary policy has the beggar-thy-neighbor effect on its trading partner and domestic expansionary fiscal policy has the locomotive effect on its trading partner.

Key Terms

Deflation (通货紧缩)
Balance-of-payments equilibrium (国际收支平衡)
Beggar-thy-neighbor effect (以邻为壑效应)
Capital mobility (资本流动性)
Consumer price index (CPI) (消费物价指数)
Contractionary fiscal policy (紧缩性财政政策)
Contractionary monetary policy (紧缩性货币政策)
Discount rate (贴现率,商业银行在中央银行贴现票据时支付的利率)
Economic growth (经济增长)
Expansionary fiscal policy (扩张性财政政策)
Expansionary monetary policy (扩张性货币政策)
External balance (外部平衡)
Hyperinflation (恶性通货膨胀)
Imperfect capital mobility (资本非完全流动性)
Inflation (通货膨胀)

Internal balance (内部平衡,国内市场平衡)
Unemployment (失业)
Locomotive effect (火车头效应)
Perfect capital mobility (资本完全流动性)
Policy mix (货币政策与财政政策的结合使用)
Required reserve ratio (法定存款准备金率)

Questions

1. What is widely used to measure a country's inflation? What are the consequences of high inflation?
2. Consider the following statements:
   a. "More people are employed in our country now than at any time in the past 30 years."
   b. "The unemployment rate in our country is higher now than it has been in 30 years."

   Can both of these statements be true at the same time? Explain.
3. Assume a government increases its spending in attempt to reduce its high unemployment rate. The country currently adopts floating exchange rate system. What is the impact of this policy on the country's currency value? The change in the country's currency value in turn has impacts on the fiscal expansion. Discuss.
4. What methods does a central bank usually use for the expansionary monetary policy? In which way does a government adopt expansionary fiscal policy?
5. If a country's overall price level is rising, the value of its currency drops in the foreign exchange market. What are the impacts of the depreciation on the country's internal balance?
6. What does it mean if a country's *BP* curve is vertical? Explain the impacts of an expansionary monetary policy on the equilibrium interest rate and aggregate output (income) under the fixed exchange rate system.
7. What is the difference in the regard of *BP* curve between a fixed exchange rate system and a floating exchange rate system?
8. Explain the locomotive effect and beggar-thy-neighbor effect.

9. In the early 1990's the United States experienced economic recessions. The U. S. government asked the Japanese government to expand fiscal expenditures and cut the taxes. Both the U.S. and Japan had nearly perfect capital mobility and both countries adopted floating rate system at that time. Would the U. S. request appear to have been consistent with U. S. interests? Why?
10. Use *IS - LM - BP* diagram to show the effect of a decrease in the foreign interest rate, i^f, on domestic output, Y^d, for an open economy with fixed exchange rate system. Explain in words.
11. Given the discussion of the effects of fiscal policy in this chapter, show the effect of a foreign fiscal contraction on foreign output, Y^f, and the foreign interest rate, i^f on *IS - LM - BP* diagram. Explain in words.
12. Given the discussion of the effects of monetary policy in this chapter, use *IS - LM - BP* diagram to show the effect of a foreign monetary expansion on the domestic country. Explain in words.
13. During the early 1980s, the United States adopted a very expansionary fiscal policy and very restrictive monetary policy in an attempt to rid the economy of inflation. Unfortunately, this policy mix had failed. The U.S. economy went into a deep recession. The interest rate went to record levels as high as 21%. Use the *IS - LM - BP* diagram to show this policy mix. Explain in words.
14. Referring back to the situation described in question 13, what do you think would happen to the value of the dollar?
15. What effect will each of the following events have on the current account balance and the exchange rate if the exchange rate is fixed?
    a. The price level in China is rising and the inflation in China is much higher than France.
    b. Chinese government uses expansionary fiscal policy to stimulate domestic consumption.
    c. China's central bank PBOC decreases its money stock.